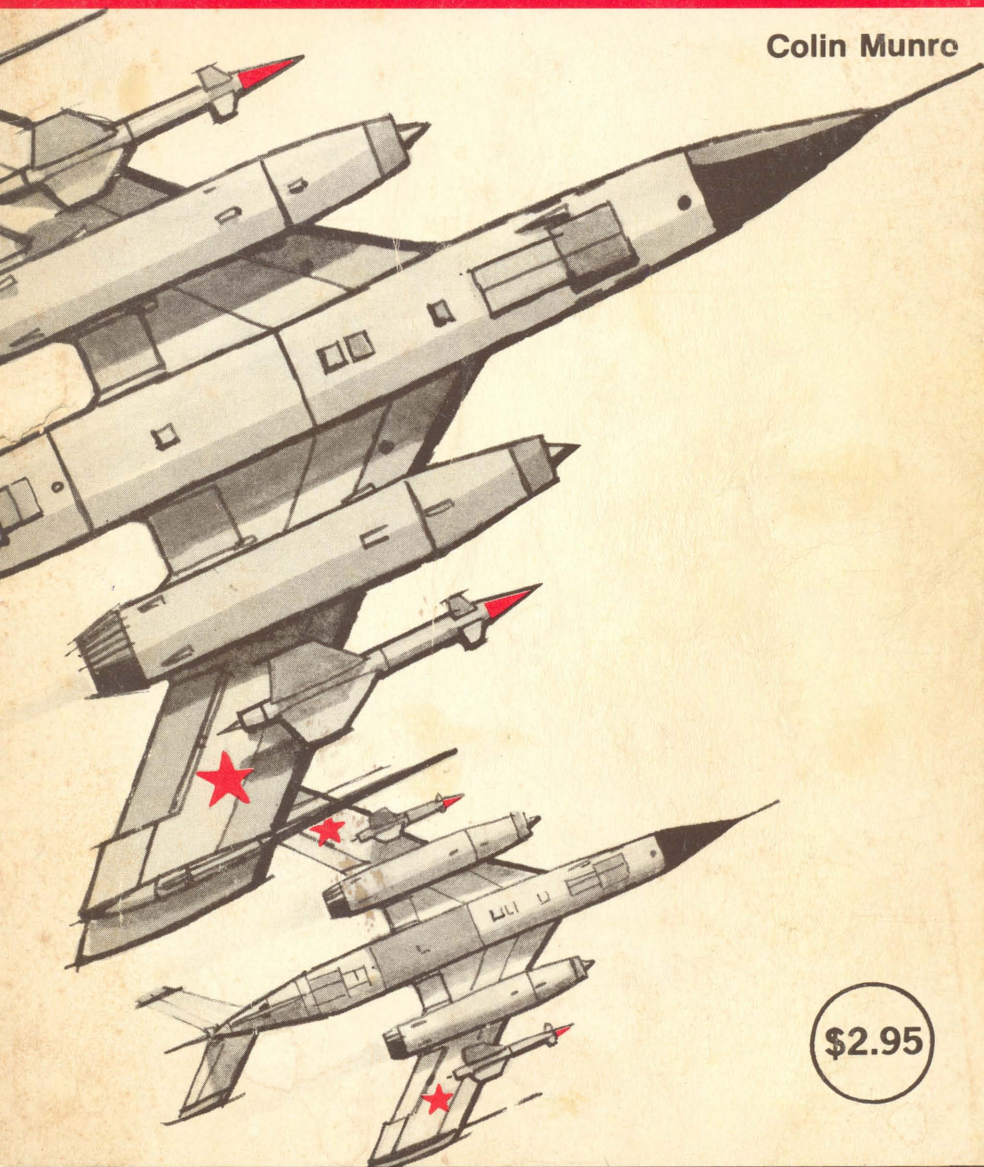


SOVIET AIR FORCES

Colin Munro



\$2.95

MODERN AIRCRAFT SERIES

MODERN AIRCRAFT SERIES

Edited by Joe Christy

A new series of popular-priced books on aircraft and their operation for everyone interested in privately owned planes. Each volume is written by an expert in the field, and is printed on fine, white paper and profusely illustrated with photographs and diagrams. Each volume \$2.95.

- | | |
|---------------------------------|----------------------------------|
| Your Pilot's License | Multiengine Flying |
| Your FAA Flight Exam | The Single-Engine Cessnas |
| Legal Guide for Pilots & Owners | The Piper Cub Story |
| Your Jet Pilot Rating | The Single-Engine Beechcrafts |
| Airmanship After Solo | All About Helicopters |
| Nav/Com Guide for Pilots | Hot Air Ballooning |
| Cockpit Navigation Guide | Parachuting for Sport |
| Pilot's Weather Guide | Soaring Guide |
| Air Traffic Control | Taking Pictures from the Air |
| Instrument Flying Guide | Modern Aerobatics |
| Computer Guide | Aces & Planes of WWI |
| Guide to Antique Planes | The Curtiss Hawk Fighters |
| Classic Biplanes | Scramble, British Aircraft WWII |
| Classic Military Biplanes | Aircraft Armament |
| Classic Monoplanes | Guide to Homebuilts |
| Racing Planes Guide | Used Plane Buying Guide |
| Club Flying | Aircraft Dope & Fabric |
| Agricultural Aviation | Lightplane Construction & Repair |
| | Lightplane Engine Guide |

Published by Sports Car Press

Distributed by Crown Publishers
419 Park Avenue South, New York, N.Y. 10016

SOVIET AIR FORCES

FIGHTERS AND BOMBERS

by
Colin Munro

New York

MODERN AIRCRAFT SERIES
A Division of Sports Car Press

CONTENTS

PART I: A Brief History

Early Soviet Aircraft Designations	9	The Great Terror	34
		The Far East	37
Start of a Soviet Air Force	10	Poland — 1939	38
The Cannon Fighters	17	Finland — 1939-40	39
The Heavy Bomber Program	21	The Design Groups	40
The "Link" Experiments	23	Rockets in Russia	45
The Airborne Idea	25	Hitler Looks East	46
Very Long Range Bombers	26	Operation "Barbarossa"	47
Tactical Support Aircraft	26	The Soviet Air Force in the Jet Age	54
The Fighter Squadrons	28	The "Copycat Bomber"	55
The Light Bombers	29	The Jet Age Begins	56
The Naval Units	30	Korea — a Testing Ground	59
Spanish Civil War	31	The Supersonic Age	61

© 1972 Sports Car Press

Published in New York by Sports Car Press, Ltd.
and simultaneously in Canada by General Publishing Company

All rights reserved under International and Pan American
Copyright Conventions

Library of Congress Catalog Card Number: 72-180631
ISBN: 0-87112-051-8

Produced for Sports Car Press by Silvermine Production
Printed in the United States of America by Semline Incorporated
from typeset by Darien Phototypographers

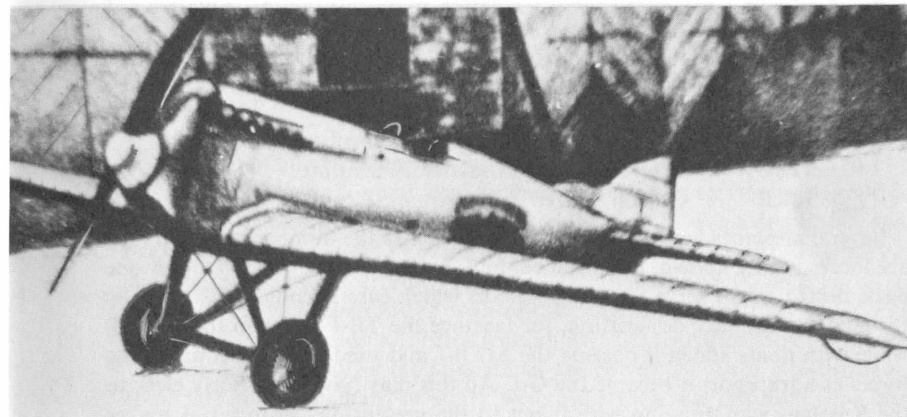
First Printing 1972

CONTENTS (CONTINUED)

PART II: Three-views Aircraft/Specs/Performance

Antonov An-2 "Colt"	66	Myasishchev M-52 "Boulder"	96
Antonov An-12 "Cub"	68	Sukhoi Su-7 and Su-9 "Fitter" and "Fishpot"	98
Beriev Be-10 "Mallow"	70	Sukhoi Su-11 "Flagon-A" and "Flagon-B"	100
Beriev Be-12 "Mail"	72	Tupolev Tu-16 "Badger"	102
Ilyushin Il-14 "Crate"	74	Tupolev Tu-20 "Bear"	104
Ilyushin Il-28 "Beagle"	76	Tupolev Tu-22 "Blinder"	106
Ilyushin Il-76	78	Tupolev Tu-28 "Fiddler"	108
Mikoyan MiG-15 "Fagot"	80	Yakovlev Yak-18 "Max"	110
Mikoyan MiG-17 "Fresco"	82	Yakovlev Yak-25 "Flashlight"	112
Mikoyan MiG-19 "Farmer"	84	Yakovlev "Mandrake"	114
Mikoyan MiG-21 "Fishbed"	86	Yakovlev Yak-28 "Brewer" and "Firebar"	116
Mikoyan MiG-23 "Foxbat"	88	Yakovlev Yak-36 "Freehand"	118
Mikoyan "Faithless"	90	Mil Mi-6 "Hook"	120
Mikoyan "Flogger"	92		
Myasishchev Mya-4 "Bison"	94		

PART I: A Brief History



The Polikarpov I-1 fighter of 1923. This picture almost certainly shows the prototype. Note that there is no sign of a radiator.

Early Soviet Aircraft Designations

Throughout the twenties and most of the thirties, Soviet civil and light airplanes were identified by the initial(s) of the chief designer responsible, or the chief of the design bureau involved. Thus we get K-1 for Kalinin's first machine, the AK-1 being a joint effort by Kalinin and Alexandrov. ANT stands for Tupolev as is well known and most, but not all, of the many light airplanes that were built during this period conformed to this simple system. It becomes more complicated when military machines are involved. Here a rigid system

was evolved which we give below. This is only a shortened list as many of the designations will be found rarely.

ARK	Arctic reconnaissance
BB	Short range bomber
BSH	Armored tactical support (also Sch)
DB	Long range bomber
DI	Two seat fighter
I	Single seat fighter
KOR-I	Ship-borne reconnaissance
MBR	Short range recce. seaplane
MDR	Long range recce. seaplane
MTB	Heavy bomber seaplane
PS	Postal or passenger
R	Reconnaissance
SB	Fast bomber
TB	Heavy bomber
Tsh	Heavy tactical support
U	Trainer

Some airplanes were designated by letters which are initials standing for the organization that designed and built them, such as

KAI	Kazan Aviation Institute
KHAI	Kharkov Aviation Institute
NIAI	Scientific Research Aviation Institute
TsAGI	Central Aero-hydrodynamic Institute
TsKB	Central Design Bureau

Several airplanes have a TsKB number as well as the number by which they are more usually known, for instance the I-Z was also the TsKB-7. Also one basic design might serve two purposes, in which case it could be known by the civil and military designation, for instance the TB-1 was also the ANT-3, while with floats added it became the MTB-I and used to support air borne forces as a transport it became the G-I. All this may have been fairly clear to the Russians who grew up with it but to the present-day historian it makes life very difficult. The present-day Russian system is very much simpler to understand.

Start of a Soviet Air Force

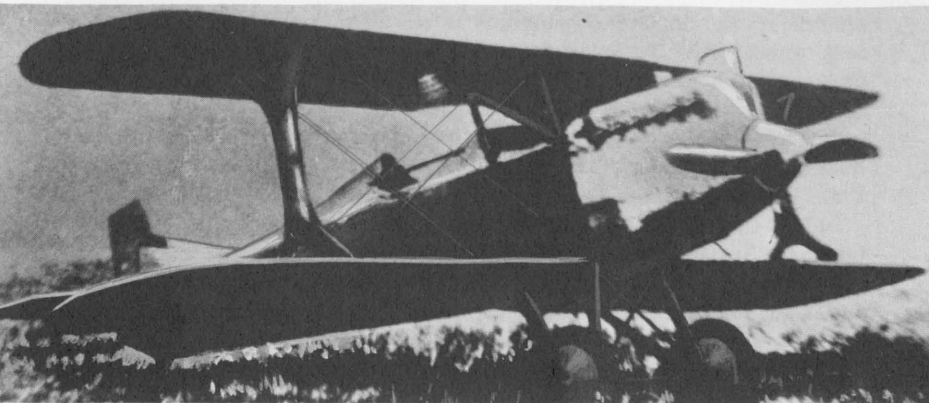
By 1924 the Soviet aircraft industry had started to turn out home-designed airplanes in numbers and as a result many of the foreign types that had been in service could at last be scrapped. Before 1924 the collection of aircraft that were in service was really amazing. Almost any airplane that had been in service in either the British, French, or German air forces in the last year or so of the war was there in small numbers, plus many that had been captured or left behind by the allies in support of the various forces involved in the chaos

after the revolution. Nobody could try to service such a motley collection for long, which is why the Soviet forces were determined to have their airplanes designed and built at home, and to get rid of all the foreign machines at the earliest possible moment, apart from matters of prestige.

One machine that was kept on for a long time was a trainer. The Russians built their own version of the famous Avro 504 for many years, calling it the U-1.

In 1924 then work started on several machines that were to be very important in the Soviet Air Force. Probably the most interesting was the TB-1 twin-engined bomber. This was designed at TsAGI under a team led by Tupolev and it was built entirely of Kolchugaluminium, a Russian developed duralumin type alloy, and had obvious touches of Junkers' thinking about it. The machine was called the ANT-4 by the design group and it was fitted with the new M-17 engines, which were B.M.W. VI's built under license. The M-17 was to be a vital engine to the Russians for some years. The TB-1 was put into service as quickly as possible and proved a considerable success, so much so that it proved to be the start of a whole range of bombers, each machine being larger than the one before. The TB-1 was also developed downwards, into the ANT-7, called either the R-6 or the Kr-6 according to whether it was used as a two-engine long range fighter or a reconnaissance machine. The ANT-7 was smaller than the TB-1 but fitted with the same engines which gave it a very good performance for its day, with a maximum speed of 150 m.p.h., about 20 m.p.h. better than the bomber version. About 200 ANT-4's were built and about 400 of the various ANT-7's. The Tupolev bureau also produced the ANT-3, an all metal reconnaissance biplane, which was produced in numbers. This had quite a good performance and was in service as an odd-job machine for many years. At the same time the R.A.F. was using D.H.9's and Bristol Fighters and was thinking about the Westland Wapiti. The Russian machine was almost certainly superior, although it would depend on the engine fitted. R-3's were fitted with several engines at one time or another, but when the last version was fitted with an M-17 the airplane became the R-4.

In the middle twenties the strength of the Soviet air force is estimated at about 600 machines, many of which were older than was desirable, and some still of foreign manufacture. But the situation was improving, and as there were no little wars going on at this time it was a time for steady organization, both in the serving units and in the factories. Training schools were being started all over the country and a great deal of effort was made to make the population air minded. Record flights were attempted and flying clubs started to get the necessary personnel and also the financial support to build up a strong air force. The civil air lines were also being built up as it was recognized that the air was a method of communication that was vital to the expansion of the more remote parts of Russia, and some of these are very remote indeed. There were competitions organized for the constructors of small light airplanes and gliders, and several of the designers of later years entered machines in these



The Grigorovich I-2bis fighter of 1925. About 200 of these machines were built.

One of the 400 Polikarpov I-3 fighters used by the Soviet Air Force showing the sleek lines. This machine has the wheel covers missing and mountings for light bombs under the wings; the two machine guns and the telescopic sight can also be seen.



contests. Ilyushin built a glider in 1923, for instance, and Yakovlev's first successful glider was flown in 1924. Flying became something of a national sport, and many of the universities and technical institutes started to run either flying clubs or a technical section to teach aircraft design and the maintenance of aircraft and engines. While the Russians were starting to build fighters by the hundred, France, England, and the U.S. were ordering them by the dozen! By 1927 all the years of planning, making do with old aircraft and the work in the factories and at TsAGI was starting to bear fruit. Units of the air forces were getting modern Russian airplanes to replace the older types and the foreign machines with which they had originally been equipped.

The basic unit of the air forces at this time was the squadron, which should have had about thirty aircraft, and which was normally divided into either two or three flights. Shortages of aircraft often resulted in units working at something about half strength. Several squadrons were made up into a brigade. For the first few years a brigade was organized as a local unit rather than a purpose unit, so that any one brigade had some fighters, a squadron or so of reconnaissance planes and some bomber units. Later on these brigades were reorganized as fighter brigades, bomber brigades and so on.

During the early and middle twenties the naval units were something of Cinderella units, still operating mainly rather ancient flying boats of Grigorovich design, smaller but probably not very inferior to most of the western designs then in service, except for the Dornier flying boats in Germany, which were clearly ahead of their time.

Work started in 1927 on the I-3, a new single-seat fighter designed by a group under Polikarpov at the TsKB. The I-3 was in fact developed from an earlier design, the 2I-N1, a two-seat fighter built round a Napier "Lion" engine, which was not put into production as the air force did not then require a two-seat fighter.

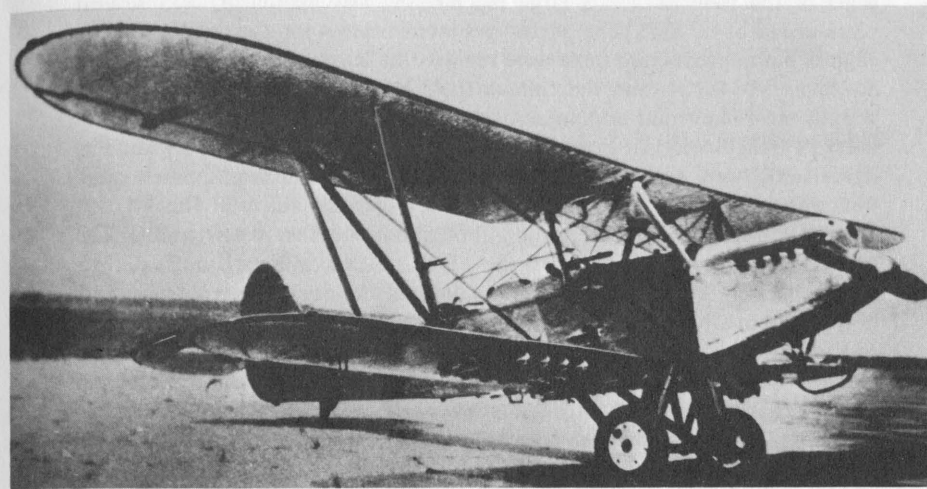
The I-3 was another matter however, and although it was not very maneuverable because of the rather heavy M-17 engine with which it was powered, it was fast for its day with a maximum speed of nearly 190 m.p.h. The I-3 carried the usual two machine guns and was chiefly built of wood, with a monocoque fuselage and fabric covered wings and tail unit. The I-3 was soon put into production and was in service until the middle thirties. About 400 were built. The author (British) rates the I-3 with the Hawker "Fury" and the Heinkel He 51 as the three most elegant biplane fighters ever built.

Work started in 1927 on the R-5, a general purpose machine which was to prove one of the outstanding airplanes of its day. The R-5 was a bigish single-bay biplane, built mostly of wood. The span was 51 ft, the length 34 ft 9 ins and it was fitted with the M-17 engine as standard, although it was used as a flying test-bed for various other engines later on. The crew was two, it carried one machine gun firing forwards and the observer had one on the usual flexible mounting to defend the tail. The normal bombload was 550 lbs. The maximum speed was about 140 m.p.h. and the normal range was 490 miles. It took two years to get the R-5 into production but once the fac-

tory got going these versatile machines were built in large numbers. The first were delivered to the air force light bomber units, which used the R-5 for reconnaissance and bombing duties. Later, a whole range of different versions were built, most of them being put into service. The R-5 was also the basis for various experimental tactical support aircraft built in the thirties. In 1931 a seaplane version was produced, the R-5a or MR-5 (also known as the TsKB-10) and a torpedo bomber single seat version was built in 1932 called the R-5T, while an assault plane was called the R-5Sh, fitted with seven machine guns and a half ton bomb load. Civil passenger versions were built as the P-5 and the P-5a which served with Aeroflot. The R-5SSS was a more powerful version, slightly cleaned up which was used chiefly for ground support, as was the still later R-Z, which was fitted with an AM-34RN engine of 750 h.p. which gave the R-Z a top speed of 180 m.p.h. It will be seen that the R-5 was a very important airplane in its day and it served for a very long time indeed. R-5's fought in Manchuria, Spain and Finland; some were used against the Germans as bombers, and many were used as ambulances. Aeroflot were still using cabin versions after the war.

At the same time the Polikarpov group had been instructed to build a new trainer. This, the party genius's said, must have fully interchangeable wings and tail surfaces. The machine was built but it would not fly and had to be redesigned, when it became the U-2 (later called the Po-2). This was another airplane that achieved fame, both as a trainer, and as a machine that could be relied upon to do almost anything. It was even used against the Germans as a light night bomber during the war. Later in 1927 Polikarpov was instructed to design a fighter with the same performance as the I-3 but with a license-built Gnome-Rhone "Jupiter VIII" called the M-22, which gave about 480 h.p. Both Grigorovich and Polikarpov were involved in the project and they both got into trouble over it. The State Security Service (then called the GRU) considered that both men were taking too long on the job and chose to consider this sabotage. The result was that both Grigorovich and Polikarpov found themselves in detention with many of their design team comrades, and in fact the I-5 fighter was evolved in an "Internal Prison" in a hangar at Factory 39, Moscow. The resulting airplane was a typical radial-engined biplane of the late twenties, originally fitted with two machine guns, and of mixed construction, with fabric covering. The top speed was lower than hoped for, about 178 m.p.h. but the machine was very maneuverable, as were most of the radial-engined fighters of those days and so it was accepted for service and put into production. The prototype had "helmet" cowlings over each cylinder but in production a more normal Townsend ring cowling was fitted. The I-5 was in production for several years and in fact about 800 were built. For comparison, the R.A.F. had about 10 squadrons of Bristol "Bulldogs" with very similar performance in service in the early thirties together with about four squadrons of Hawker "Furies" which were about 30 m.p.h. faster.

The other fighter of the late twenties that was used by the Russian Air Force was the ANT-4, which was designed under Tupolev by P. O. Sukhoi



A standard light bomber Polikarpov R-5. It first flew in 1928 and all told over 6000 R-5's of all types were built. R-5's flew in Spain and the Far East against the Japanese, in Finland, and even against the Germans.

and which went into service as the I-4. The I-4 was an all-metal craft that started life as a sesquiplane, but which, in its later versions in service had the bottom wing reduced to a small surface to carry the bottom of the V strut bracing the top wing. The I-4 had the "helmet" cowlings over the cylinders as standard. The I-4 was strong and was in service for many years, some 370 being built. It was used for various experiments later in its service life. Normal armament was two machine guns. The top speed was rather low, being about 160 m.p.h. but it was maneuverable and easy to fly and so it was popular with the pilots.

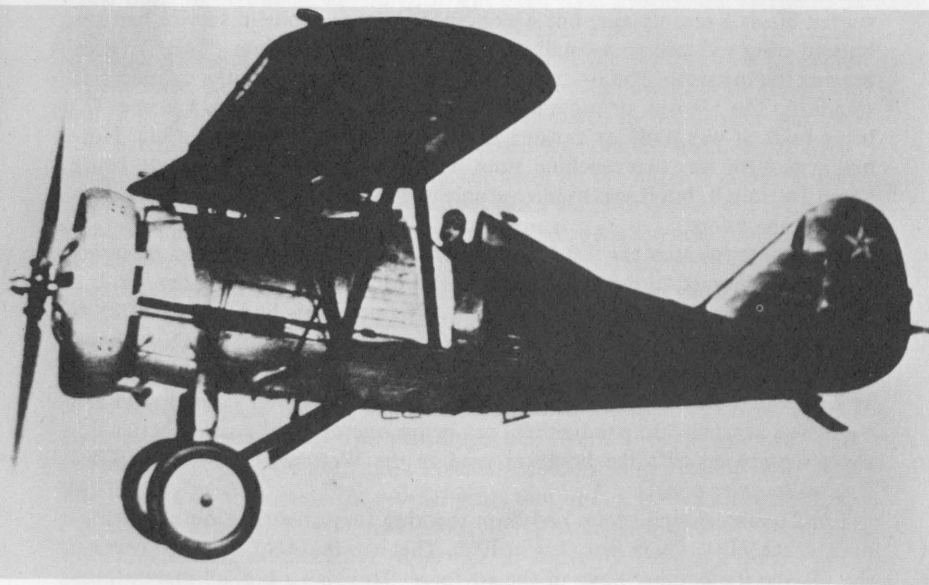
By the late twenties the TB-I was in service in fair numbers and thoughts were being directed to replacing it in the future. Polikarpov built the TB-2, a very clean biplane bomber with two M-17 engines. This had a span of 88 ft 7 ins and was 58 ft 10 ins long. The performance was not very exciting, however, with a top speed of 135 m.p.h. The bombload was only about 1,600 lbs and the range was 740 miles. This, it seems, was not good enough and the TB-2 was not put into production, not being one of Polikarpov's better designs. Compared with the bombers used in the West at this time the TB-2 was really quite good.

The Tupolev design group had been working for some time on a development of the TB-I, which first flew in 1930. This was the ANT-6, which became the TB-3 in the bomber units of the air force. This was a big, all metal, four-engined machine rather cleaner than most of its day although it was rather angular. This machine was to be in service for many years and, in the last

years of the twenties was a large machine by any standards, and several years ahead of its time. The prototypes were fitted with Curtiss Conqueror engines but in production these were replaced by Russian motors, first M-17's and later M-34's. During the thirties the TB-3 was to become one of the world's most important airplanes.

By 1930 the Soviet Air Force had become a force to be reckoned with. The fighter units were equipped with I-3 and I-4 fighters which compared quite well with other fighters in other air forces, especially the I-3. The I-5 was coming into service in numbers and although not very fast it was nimble. The bomber units were equipped with the TB-I and this, although not exciting, was very much tougher than the fabric covered biplanes that equipped most of the western air forces. The R.A.F. for instance relied upon a few squadrons of Vickers "Virginia" bombers, which would not have been very out of place over the Western Front in 1918! The author can remember them in 1936, still in service, at air shows he attended as a schoolboy. They had a top speed of 108 m.p.h. The light bomber squadrons had many of the R-5's and these compared very well with most of the other machines of its day, such as the popular Fokker C.V.

In 1930 the Soviet Air Force had about 1,000 planes, many of which were of a high standard for their day. Of these nearly 200 were in the Far East, where Japan was seen as needing watching. Some were strung out along the



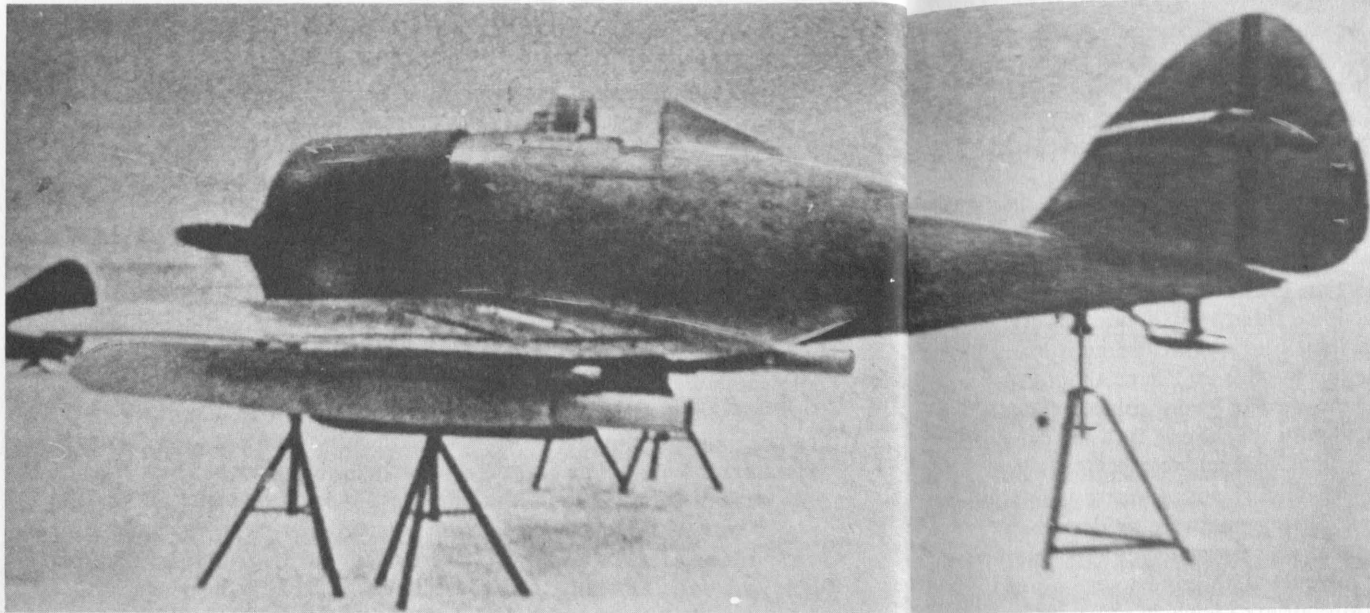
A standard Air Force Polikarpov I-5 fighter. About 800 of these little fighters were built and they were still being used as fighter-trainers when the Germans invaded in 1941.

southern border, overlooking India, and the remainder were in the West, where European nations were thought of as the chief menace. At this stage, most of the German instructors had gone home and training was in the hands of Russian staff only. It is likely that this was the weakest point in the Soviet Air Force at this time as the instructors had had no combat experience and political training was considered important. The time spent in the political lectures could have been better spent getting more practice in navigation and bomb-aiming. One aspect that the Russians had to prepare for more than anyone else was winter flying. Most of their airplanes could, and often did, fly off snow covered airfields fitted with skis. This applied to bombers as well as to all the smaller types, all of which had to fly under conditions that may well have grounded most other air forces. Perhaps this is why Russian airplanes were equipped for "Hucks starting" until well into the forties.

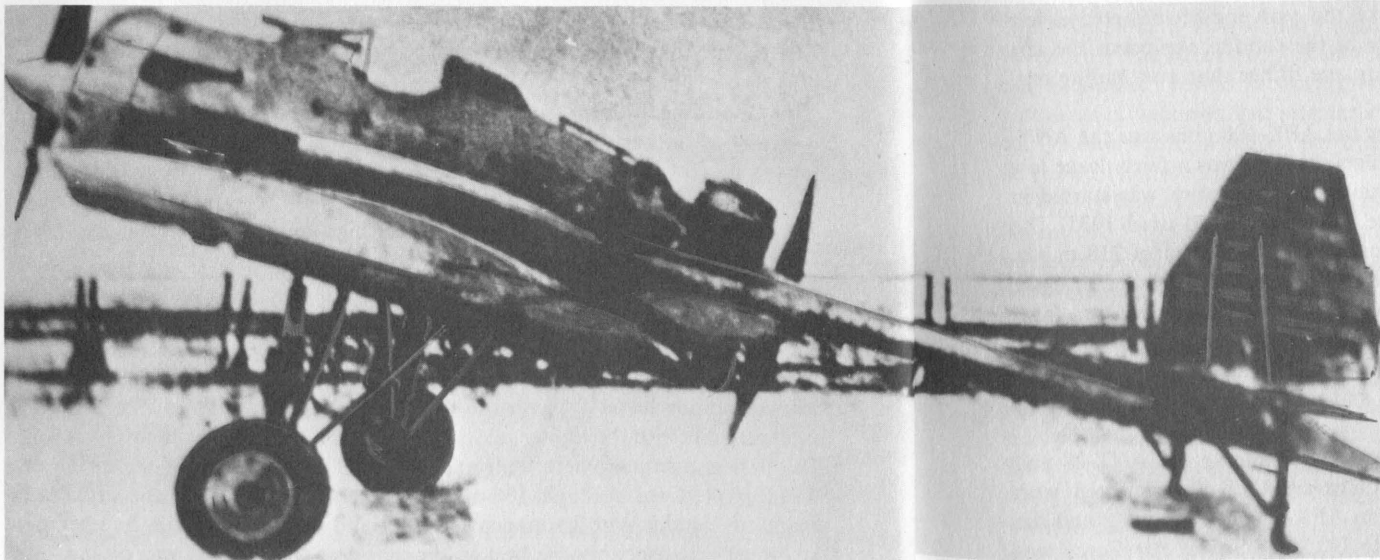
Within the Soviet Air Forces, the early thirties were a time of much experimenting and the first series of experiments concerned fighter armament. Most fighters of the late twenties and early thirties were biplanes armed with two, or in a few cases four, machine guns. It could be seen that this sort of armament was not much use against bombers that were becoming stronger and better armed themselves but most of the heavier guns that were available were heavy and bulky and not suitable for fitting to a fighter of the day. In England Westland had built a fighter fitted with a 37 mm cannon but it was not accepted for the R.A.F. When the Red Army finished testing a recoilless cannon developed by Kurchevski it was suggested that it might be a weapon that would interest the air forces. As a result an I-4 was fitted with two of these weapons, the 63 mm DRP-63, and tested during the summer of 1931. The results were so good that Grigorovich was instructed to develop a new fighter to be fitted with these weapons.

The Cannon Fighters

The first of the new fighters was something of a "lashup". To speed up work on the prototype Grigorovich took the front half of a standard I-5 fighter, complete with engine, to which he attached a new rear fuselage and a new low mounted wing. The tail was mounted high on the fin to clear the blast from the cannon when they were fired. The guns fitted were DRR-76 weapons of 76 mm and one was carried under each wing. The resulting airplane, with a simple undercarriage and strut-braced wings and tailplane, was called the I-Z, also having the design number TsKB-7. The idea behind this machine was that the pilot fired a 7.6 mm machine gun until the tracers were seen to hit, whereupon he let fly with the single-shot DRP-76's. The I-Z was a very popular craft with the fighter pilots, who found it easy and agile to fly. About 70 of these machines were built and equipped several units of the air force. The top speed was not high, 186 m.p.h. not being very good for the day, but it made up for this with its maneuverability and armament. As a bomber destroyer it was probably the best in the world at the time. It was built a few



The Grigorovich IP-1 cannon fighter. Note the DRP-76 cannon mounted under each wing. About 80 of these fighters were built.



The experimental I-12 cannon fighter showing the two engines and the way the cannon made up the tail booms.

months before the American Boeing P-26 which was smaller, more powerful, and carried only two machine guns and was, of course, faster.

The success of the I-Z was such that further development of both guns and airplanes was considered worthwhile. The guns were altered to have a magazine holding five shells each and a new airplane was designed by Grigorovich which was the DG-52, called the IP-1 in service. The DG-52 was a small low wing monoplane with a backwards retracting undercarriage and generally clean lines. The DRP-76 cannon were carried one under each wing. The engine was an M-25 radial of 750 h.p. and two machine guns were carried. The IP-1 was ordered into production but by this time the I-16 was also in production and this had a superior performance and was fitted with 20 mm ShVAK guns with a high rate of fire. The IP-1 was also fitted with these guns later instead of the DRP-76's and this raised the top speed from 236 to about 270 m.p.h. but the I-16 was still the better machine, despite its difficult handling. Only about 80 IP-1's were built. (When fitted with the 20 mm ShVAK guns it became the IP-4.) While these single-seat light fighters were being built, two design groups at the TsAGI were working on airplanes to carry two of the even bigger APK-100 guns of 102 mm. These guns were no less than 13 ft long and very heavy so that fitting them in a normal type of fighter presented the designers with considerable problems. Both groups were working under A. N. Tupolev and the resulting aircraft are known as ANT types. The first was the ANT-23 (or I-12) which was designed by V. N. Chernyshov. This odd craft was a twin-boom low wing monoplane, the cannon making up the tail booms! Two Bristol "Jupiters" were fitted, one at each end of the stumpy fuselage. The performance and maneuverability of the ANT-23 were very poor and the pilots did not like the rear engine mounted a few feet behind them. When on test firing one of the cannon exploded, the test pilot preferred to stick with the battered airplane rather than risk bailing out. The ANT-23 was abandoned.

The other heavy fighter designed to carry the APK-100 guns was the ANT-29, designed by a team under A. A. Arkhangel'ski. This was a fairly large low wing monoplane fitted with two M-100 engines. Design work was started in 1932 but had a low priority and the plane was not finished until 1935. The ANT-29 had a span of 62 ft 11 ins and managed a top speed of 218 m.p.h. which was not very exciting. The two APK-100's were carried one above the other in the lower port side of the fuselage, the compensating charges from the guns being exhausted through a long tube at the rear of the fuselage. The air force designation for the ANT-29 was DIP but as it was unsatisfactory as a fighter, being unstable and slow, and work was not continued with this machine.

The ANT-40 bomber was designed at the same time as the ANT-29 and they are very similar in many respects. Later an ANT-40 was fitted with Gnome-Rhone 14Krsd radial engines and an APK-100 in each wing and the result was called the DI-8 but by then, late 1935, the Soviet Air Force was

more interested in the RS-82 rockets that were showing signs of being what they wanted and so the heavy cannon program was halted.

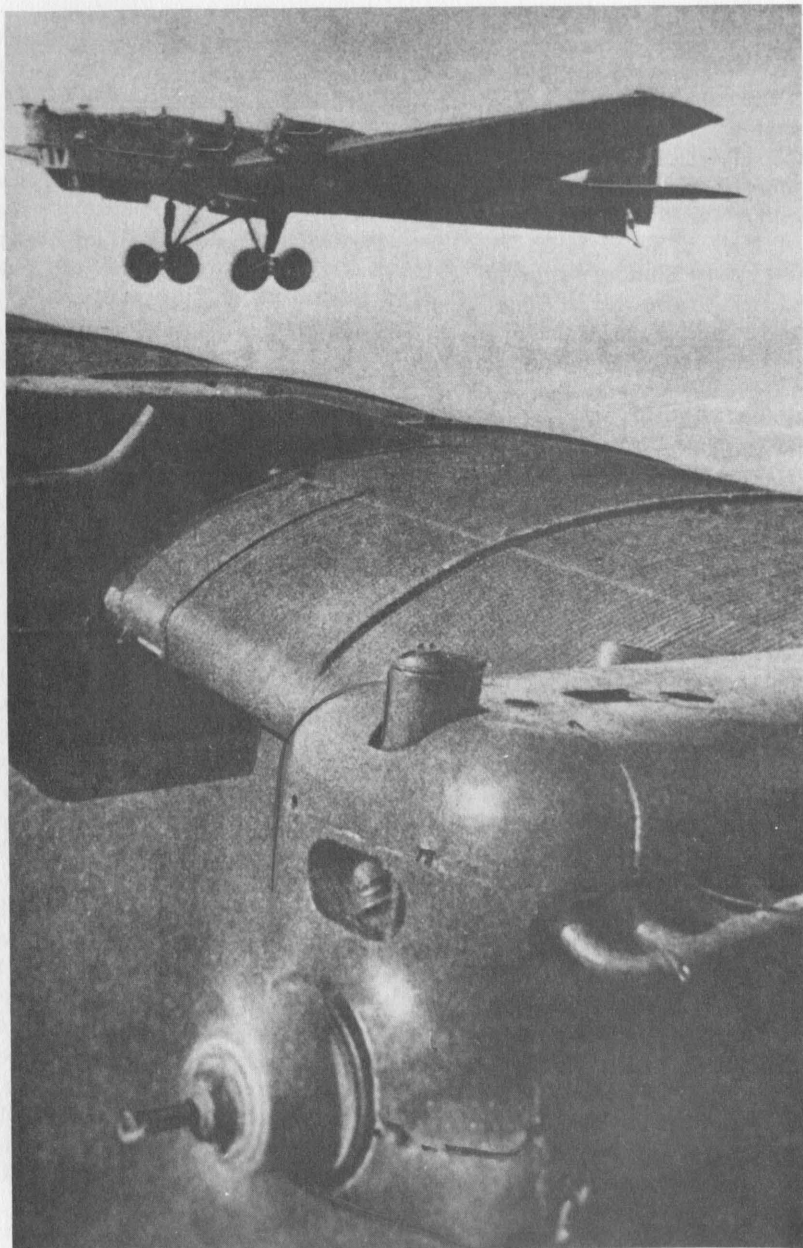
While the heavy cannon program was not really much of a success, except perhaps for the I-Z, it does show that the Russians realized that two peashooters were totally inadequate as the armament for a fighter, and that in future heavier guns and more of them would be needed by any fighter in service if it was to be of any use in combat.

The Heavy Bomber Program

As mentioned earlier, the late twenties saw the TB-1 in service as the standard bomber of the Soviet Air Forces, with the TB-2, designed by Polikarpov, not accepted for production, even though its performance was better than many of the bombers then in service in the West. In 1930, the prototype of the TB-3 (or ANT-6) first flew, and despite an alarming first flight when it nearly crashed, the TB-3 was soon put into mass production. It was rather an angular airplane, built entirely of metal, with corrugated covering. It had a wing span of 132 ft 10 ins and a length of 81 ft, the normal take-off weight was 38,500 lbs and fitted with four M-17 engines it had a top speed of about 135 m.p.h. The range was about 1,350 miles. Ten machine guns were carried in five positions, each with a double gun mounting. There was one in the nose, two behind the wing above the fuselage and one under each wing. The bomb load was up to 5,000 lbs. For comparison the R.A.F. was getting excited about the Handley Page "Heyford" at about the same time which had three machine guns and a bomb load of 3,500 lbs over a short distance, really the "Heyford" was more comparable with the rejected TB-2. The U.S. Army Air Corps was flying Keystone B-4's and B-6's which were barely up to the standard of the "Heyford". The French at this time were in the middle of what one can only call a "Gothic" period of design, with large deep slab-sided fuselages with vast areas of windows and angular shaped wings, tails and cabins, all intended, it would seem, to inhibit performance. The TB-3, when it first came into service in 1932 was the best service bomber in the world.

By May Day 1933, 50 took part in the fly past and a year later no less than 250 of these big machines took part! Every other air force was ordering its bombers by the dozen. Needless to say, as newer, more powerful engines became available the TB-3 was altered to take them and there were many different versions, used for many different jobs. The TB-3 was the bomber version but used as a transport for support of the army; carrying a vehicle for instance, it became the G-2. The TB-3 was used for many of the Arctic exploration operations in the thirties, and this big craft could be operated off snowy air fields using skis. Later versions, fitted with AM-34RN engines of 900 h.p. could carry up to a maximum bomb load of 12,800 lbs of bombs, normally 220 pounders. The TB-3 was in service throughout the thirties.

From the TB-3 was developed the TB-4. This was really a much bigger version of the TB-3 with a wing span of 177 ft 4 ins. It had six AM-34 engines,



A TB-3 bomber taken from another similar machine. There were many versions of the TB-3; these are early types with the twin wheel undercarriage units.

two mounted in tandem above the fuselage. The TB-4 was designed with a large bomb load in mind and the top speed was not considered important. The original design had a span of about 300 ft and a bomb load of 25 tons but this was reduced and the finished aircraft could carry 40 bombs of 550 lbs weight, all in two internal bomb bays. The TB-4 first flew in July 1933 and was at the time easily the largest bomber in the world. Tests showed however that while it could carry the required load, the performance generally was very low. Propeller efficiency was not very good and the two engines above the fuselage did not run very happily and so the top speed was only 124 m.p.h. at sea level, while the ceiling was a miserable 9,100 ft. Clearly this was not good enough and so the design was scrapped.

At much the same time Grigorovich had designed the TB-5, work on which had started in 1930. This looked rather like one of the Farman bombers that France experimented with about the same time and put into service about 1934. The TB-5 had a span of 102 ft and a length of 72 ft 7 ins, and the normal take-off weight was 27,600 lbs. Originally designed by A. A. Bessonov, the prototype was fitted with four "Jupiter VI's" of 450 h.p. The FED motors were planned to give about 1,000 h.p. but were not proceeded with. The TB-5 was of mixed construction, chiefly aluminum or steel tubing with fabric covering. The fuselage was built in three sections. The wing was fitted to the top of the fuselage, making it a shoulder wing design, and the engines hung on a system of struts under the wing. The front engines were now cowled, but the rear engines had a form of Townsend ring fitted.

The TB-5 first flew in March 1931, and it soon became obvious that the performance was not as good as was hoped for. During the test flying one of the engine mountings broke and a fire started. The airplane was saved, but it was decided not to repair the machine as the performance had been so poor. (Top speed 112 m.p.h. at sea level.)

Two other bomber projects of the early or mid-thirties ought to be mentioned. One was Project "Giganta" started in 1931 and intended to have 12 M-17 engines. Various layouts were projected, including having two engines geared to each propeller but in the end this project was dropped in favor of the ANT-20, which was known as the "Maxim Gorki".

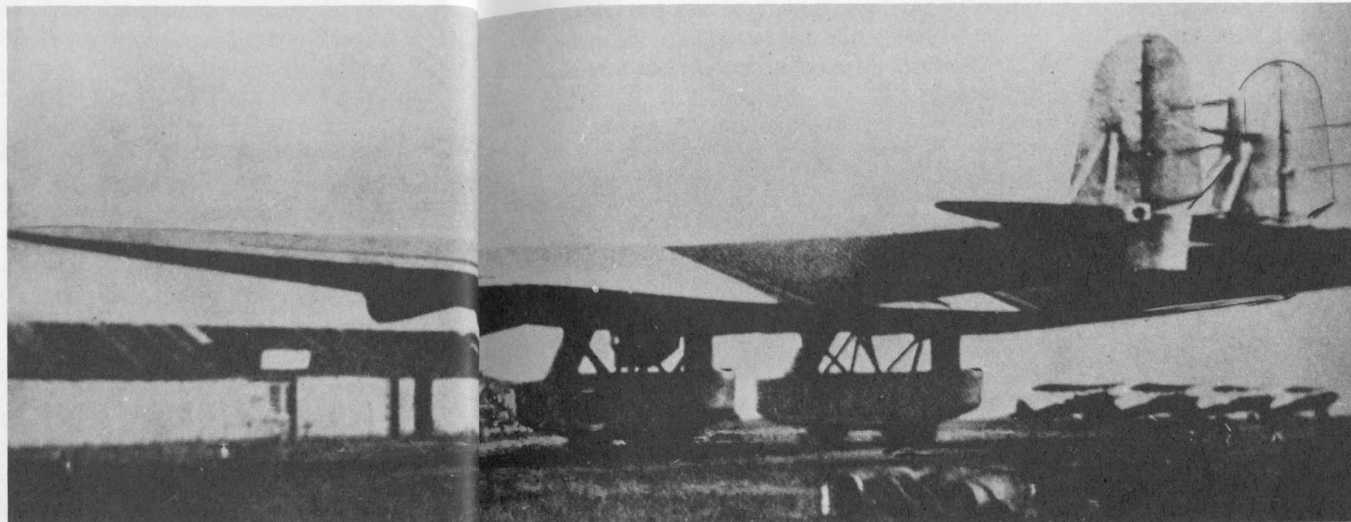
Another big airplane, intended as both a bomber and as a passenger transport, was the Kalinin K-7. Up until then K. A. Kalinin had built single engined transports of some elegance with some success. The K-7 was his undoing. It was a big twin boom monoplane with the undercarriage wheels fitted in "gondolas" on struts under the wing. The wing, with a span of 174 ft, was elliptical, and carried six of the seven M-22 engines in the leading edge in the usual way. The seventh engine was a pusher, mounted at the rear of the short fuselage. On test one of the two rudders developed flutter, a boom collapsed and there was a spectacular crash.

The "Link" Experiments

One of the troubles in defending a country as huge as Russia is that the

23 20%

The mighty seven engined Kalinin K-7 bomber prototype, which crashed during a test flight. Note the line of R-5's in the distance.



range of the average fighter is not sufficient to reach the border from its normal base, unless the fighter bases are strung out along the very long borders. Even then it would be easy to miss the intruder and find oneself too far from base to make a safe return. To try to get around this difficulty a program was started under V. S. Vakhmistrov to try out the possibilities of bombers carrying satellite fighters to the combat area. TB-1 aircraft were used at first as one would expect. How the system worked was this: The mother aircraft was parked at the required spot and long wooden ramps were pushed into position so that the fighters could be moved into position. The fighters were then moved up the ramp and locked in position on the top of the TB-1 wing, with with the tail raised so that when the bomber was in a normal flying position so was the fighter. At take-off the fighters used their engines, but as soon after take-off as possible the fighters shut down their engines and were carried to the combat area. At a given signal the fighters started their engines, were released and flew off, having the advantage of nearly full tanks so that their range was much better than it would have been operating normally. The first experiment, "Link-1" was carried out by two I-4 fighters carried by a TB-1. "Link-2" was carried out later with a TB-3 carrying three I-5 fighters, one each above each wing and one above the fuselage. "Link-3" and "Link-5" were both systems with TB-3 mothercraft and I-Z fighters, while the rather later "Link-6" was a TB-3 carrying two I-16 fighters, one under each wing. The most spectacular of all was "Link-7" in which a TB-3 carried an I-5 above each wing, an I-16 below each wing and an I-Z could attach itself to a trapeze under the fuselage once the group was airborne. Nothing much came of

the "Link" program as the chief supporters of the idea fell foul of Stalin and were liquidated in 1937.

The Airborne Idea

Yet another idea that must be credited to the Russians during the early and middle thirties was that of an airborne army. Parachuting had been a sport in Russia for some time, as it had in Germany, but the Russians had taken it some steps further. The first few units were formed in 1930 and trained using various aircraft, usually the TB-1, the ANT-9 passenger plane and even our old friend the R-5. By 1932 there were about 4 battalions of airborne troops, all trained parachutists, and one of these battalions was in the Far East. By 1934 the airborne forces standardized the TB-3 as their carrier plane as these machines could carry a light tank or a truck. Whether at this stage the Russians could drop the tank by parachute as was done later is not clear.

All this had been done in the utmost secrecy, but in 1935 Western army staffs were invited to the Red Army maneuvers at Kiev. Here, to the astonishment of the visiting brass hats, a force of about 1,000 fully armed and equipped men was dropped from a fleet of TB-3's. But it seems that the only army to take any notice of this feat was that of Germany, and the history books show that they learned the lesson very well indeed, while it was not until the end of 1940 that England managed to start training a few soldiers in the art of parachute jumping, just ten years after the Russians. One is tempted to wonder why, with this early start, the Soviet airborne forces did not do more than they did. The chief reasons seem to be that the TB-3 aircraft had to

double up as both troop transports and bombers, there were not enough to give both forces their own airplanes. Another reason can be found in the massive purge of officers from about 1936, which affected all units of the forces.

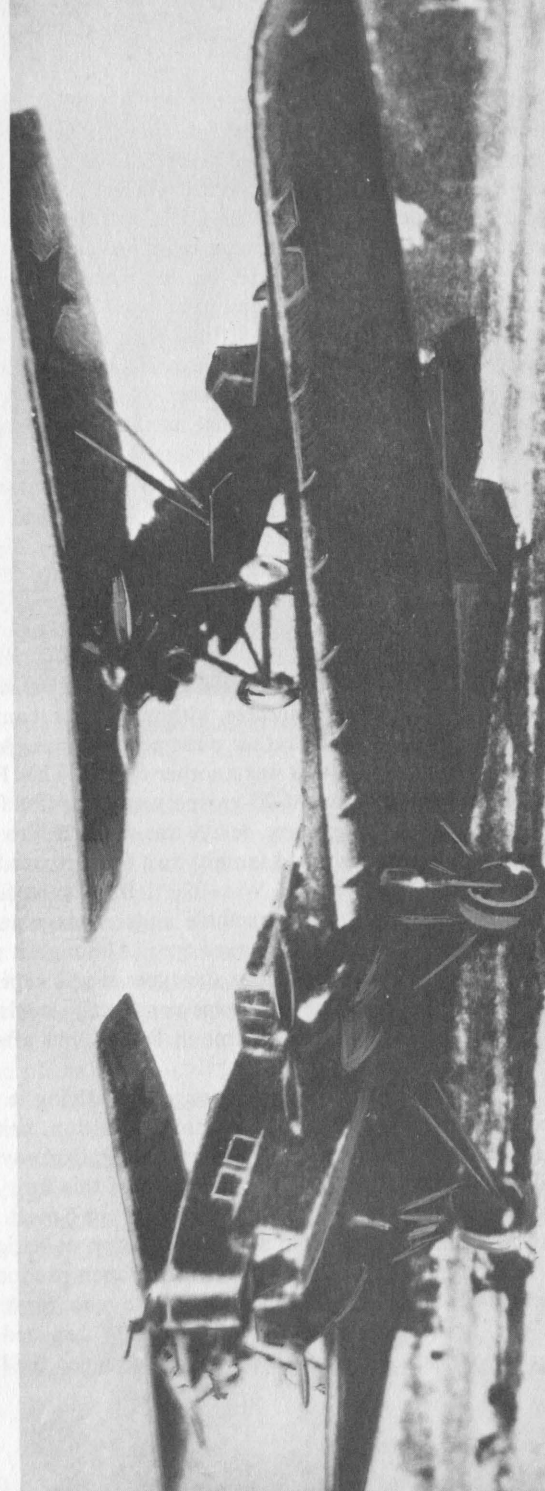
Very Long Range Bombers

In the middle thirties, the Russians felt a need for very long range bombers. While for most operations in Europe or the Far East a range of about 1,000 miles was quite enough to get to most targets, the Russians were thinking of a range of three or even four thousand miles. American readers are invited to speculate what targets these machines were intended to bomb! The first machine built was the ANT-25, known in the Soviet Air Force as the RD. You may remember this big single-engine monoplane for the records that it set up in 1936 and 1937, flown by Colonel Gromov and his crew non-stop from Moscow to San Jacinto, California. What the world at large did not know was that the RD version of this machine was intended to carry about a ton and a half of bombs!

The RD, ANT-25, or DB-1 was designed by Sukhoi as was its development, the ANT-37. This was a twin-engined machine intended for much the same type of operation but with a slightly longer range. While the range required was obtained, with a small bomb load, and a very light defensive armament, the speed at which this was achieved was very low, that of the ANT-25 being about 130 m.p.h. while the ANT-37 could only manage 187 m.p.h. The R.A.F. had a rather similar machine, the Vickers "Wellesley" which was really not very much better. The Russian machines were only built in very small numbers.

Tactical Support Aircraft

Yet another type of airplane that the Russians experimented with in the thirties was the armored ground support, or ground attack craft. In 1930 a team at the TsKB under Grigorovich started building such a machine, based on the R-5. Various methods of attaching the armor were tried, either welding, bolting or riveting the armor plating on to the basic framework. The armament was eight machine guns, four under each wing in a detachable pack. The first versions of this series was the LSh, but with an armored cockpit canopy this was too heavy and the final version was the TSh-2 (or TsKB-21), which had open cockpits and the armor plating was bolted to the fuselage. About ten of these machines were built and with a top speed of 135 m.p.h. it was hardly exciting. S. A. Kocherigin produced the TSh-3 which was quite a good looking low wing monoplane, fitted with an M-34F engine and a "trouser" type undercarriage. This was not put into production, however. The army support units just had to use unarmored R-5's for the time being, but this type of aircraft was not forgotten, and when war clouds started to gather over Europe, Russia developed this concept with great success, as we shall see.



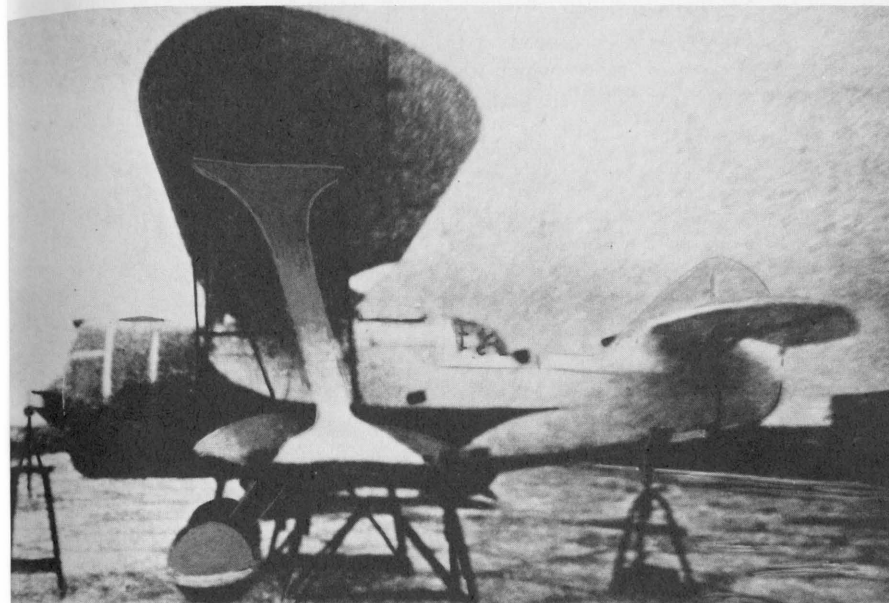
Z-1, the first of the Zveno, or Link, experiments. The bomber is a TB-1, with a non-standard reinforced undercarriage, while the fighters are late series I-4's. Note the very small lower wing of these I-4's.

The Fighter Squadrons

We saw the Russian fighter squadrons in the late twenties being re-equipped with new Russian-made fighters which were being built in fairly large numbers for those days. The units were getting either I-3's, I-4's, or most recently the I-5. There had been a development of the I-5 called the I-6 but this was not put into production, and some units were equipped with the I-7 which was in fact the Heinkel HD.37c built under license. These fighters were all in service for some years although the designers were busy building new types. A Tupolev design group built the I-8 fitted with a Curtiss Conqueror engine, but this, like the I-9, designed by Grogorovich, was not put into production. Nor was Polikarpov any luckier with the I-11 or the I-13, neither of which got beyond the prototype stage. The next machine to be built in numbers for the Soviet fighter units was the I-15, designed by N. N. Polikarpov. This was a small mixed construction biplane, fabric covered, and powered at first with a Wright Cyclone SRG-1820 and later, the Russian version of this engine, the M-25. Normally carrying two machine guns this little machine was quite fast for its day with a top speed of 224 m.p.h. and it was agile in the extreme. It first flew in 1933 and was in service a year later, being built in large numbers. More or less at the same period Polikarpov had designed a low wing monoplane fighter, the TsKB-12 fitted with an M-22 engine.

At the same time a Tupolev group had built the ANT-31, which was designed in fact by Sukhoi, was not a success, although work continued for about two years trying to improve its rather poor performance. Although it had the service designation of I-14, this was another failure. The Polikarpov design, however, once fitted with an M-25 engine was quite fast for its day with a top speed of 286 m.p.h. After some delays this was put into mass production as the I-16, which became world famous as a fighter over Spain, the Far East and even in the Second World War. The I-16 was the first monoplane fighter to go into service with a retractable undercarriage and when it first went into squadron use it was an advanced type. Although it was developed over a period of years into seven major sub-types it was kept in service too long and at the end of its service life it was completely outclassed. The I-15 and the I-16 had made Polikarpov's name in Russia, but after this his luck ran out.

The TsKB-15, or I-17, was his next fighter design, first flying in 1934, but despite much experimental work it did not go into production, neither did a whole range of experimental radial-engined fighters that Polikarpov designed, the I-180, the I-185, the I-187 and the I-190. The result of this was, of course, a delay in production of a new generation of fighters, as the Soviet Air Force units had to wait for some fighters from a new generation of designers who were starting to lead design groups of their own. These men produced planes that, for the most part, are familiar names to anyone who remembers the Second World War, or who has read about it. Ilyushin designed the I-21, which did not go into service, Mikoyan and Gurovich designed the I-20 which



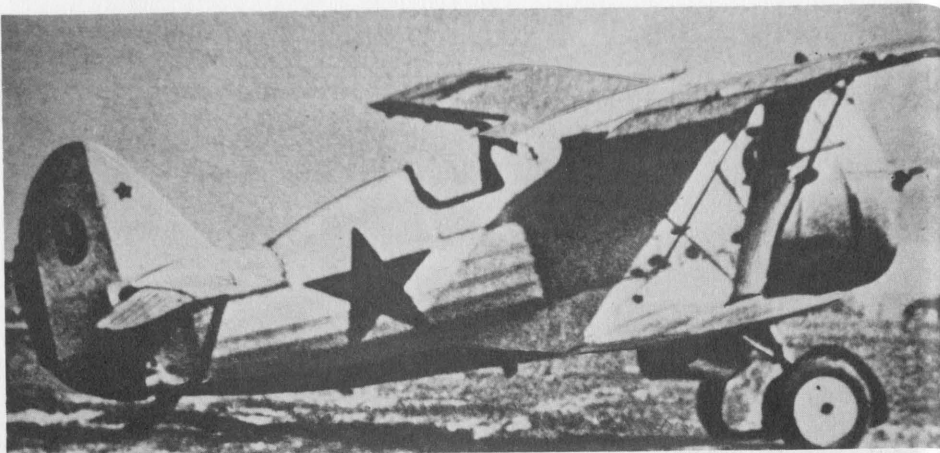
A Kochevichin DI-6 two seat fighter, some of these were used in the battles with the Japanese in 1938 and 1939.

became the MiG-1, Lavochkin designed the I-22, and this became the LAGG-1. These new machines were all being developed in the years 1939 and 1940 and were due to give the Luftwaffe some nasty shocks. Later versions of these machines were very good fighters in combat, being simple and sturdy, but it was 1941 before any of them were to be produced in any numbers. There was also a range of two-seat fighters built although none of them was built in very large numbers. The machine that was the most successful in this category was the little biplane designed by S. A. Kochevichin in 1934. This looked rather like a two-seat I-15, except that it had a retractable undercarriage, as had the later version of the I-15 the I-153. This little machine had quite a fair performance and was put into series production, although it was not built in large numbers.

The most interesting machine of this type that was not built in numbers was the DI-4, designed by a Frenchman in Russia at the time, Andre Laville. This was rather an elegant gull-wing machine with two fins and rudders and a Curtiss Conqueror engine.

The Light Bombers

Throughout the thirties the light bomber squadrons of the Soviet Air Forces were rather ignored, which is odd when you consider the importance the Rus-



A Polikarpov I-153. This type, with a retractable undercarriage, was the last of the series of biplane fighters in the Soviet Air Force. It was developed from the I-15 and the I-15bls.

sians attach to supporting their ground troops. The airplane that was intended as an R-5 replacement was probably the Nieman R-10. This was a development of the KhAI-1 six-seater passenger plane built at the Kharkov Aviation Institute in 1932 and which was faster than the I-5 fighters then in service. The R-10 was a long time in development and by the time it was ready for service it was getting out of date.

Various designs of radial-engined two-seat machines had been tested but none of them were favored very much although the Sukhoi Su-2 did eventually go into service. Interest was far greater in the armored attack type and here, after many designs and projects the Ilyushin Il-2 eventually was built in high numbers. The light bomber units in fact were eventually equipped with new twin engined types, the best known being the SB (fast bomber) series. These machines were a product of the Tupolev group and can be considered a development of the ANT-29 cannon fighter. The SB-2, or ANT-40, was designed in 1933-34 and was expected to carry a small bomb load about 500 miles at a speed of about 120 m.p.h., which was very much faster than the TB-3's and R-5 and R-6 machines then in service. In the event, as a result of careful streamlining and detail work, the prototypes were faster than the fighters brought out in the same year! The SB series were built in large numbers and were in service for many years, too long really, as by the time the German attack caught up with them they were becoming rather out of date. The replacement machine was to be the Tu-2, but this was not ready until 1942.

The Naval Units

Somehow the Naval units in most air forces seem to be the units that get the

oldest airplanes. For many years the Soviets had continued to operate Gribovich biplane flying boats of rather ancient design, and it was not really until 1930 that there was any hope of them getting anything newer. In that year the TsAGI designed a flying boat using the wings of the ANT-7 with the same engines mounted above the wing on struts in the way that was usual in those days. This was quite a successful boat and it was put into production as the MDR-2.

About the same time, Beriev started work on the MBR-2, which was a single-engined machine for short range coastal patrol work. This was a very successful type and it was in production for years, some 1,500 being built. There was a civil version built to carry 8 passengers called the MP-1.

For long distance patrol work the Russians were not so lucky. The ANT-27 was built, a big three-engined monoplane with a top speed of 145 m.p.h. and a range of 1,250 miles. Both of the prototypes crashed on tests and service machines had to be built without the tests being finished. Not many were built but they did at least do the job required of them for a long time. Before this the ROM-1 and 2, and the ANT-22 six engined twin-hull flying boat had been built without much success and in 1937 the ANT-44 was built, looking rather like the British Short "Sunderland" but this hit trouble and was only built in small numbers. In view of all this it is perhaps hardly surprising that the Russians decided to build the Consolidated PBV, which they called the GST. This was in use for many years.

It was not until 1938 that the Soviet Navy got a Russian designed catapult seaplane, previously relying on some Heinkel HD 55's. The KOR-1 was designed by Beriev and was a small two-seat radial-engined single-bay biplane with "I" struts. It was mounted on a single main float with wing-tip floats. It is recorded that when the Germans attacked in 1941 the Soviet Navy was so hard up for operational aircraft that KOR-1's were fitted with wheel undercarriages and used for ground attack.

Spanish Civil War

When the Spanish Civil War broke out in 1936 there had been a period beforehand of considerable tension and it would seem that the decision to back the Republican Government had been taken in Moscow before the actual start of hostilities. Shortly after the start of the war some 200 pilots and 1500 ground personnel left Odessa in three ships bound for Cartagena, with I-15 fighters on board. This force soon set up camp and in November the first 25 I-15's were operational.

At first there was not very much opposition although as the Germans and Italians started to support Franco this soon changed. Shortly after the I-15's arrived some I-16's were sent to support them as the Russians considered the two types to be complementary. Soon the Russian pilots, all "volunteers" of course, found themselves fighting the German Condor Legion flying Heinkel He 51's, elegant planes which were by then rather out of date. The I-16 had

little trouble with the He 51 although when, a little later the Italian Air Force arrived with its Fiat C.R. 32's, it found that things were not quite as easy as at first thought. The C.R. 32 was slightly more agile, and was certainly a better gun platform.

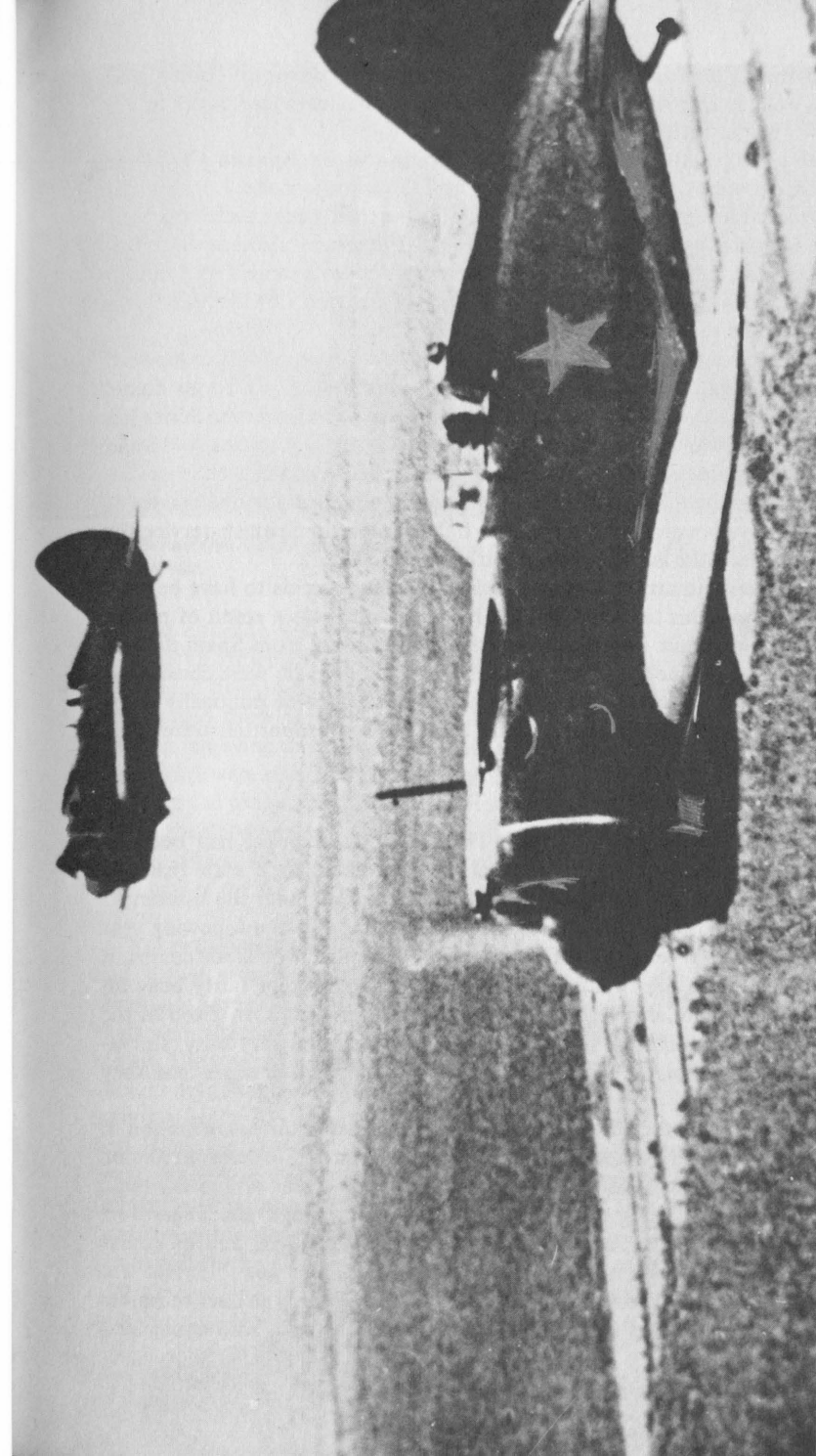
The Russians shipped large numbers of planes and personnel to Spain, but although they were there, in theory at least, to support the Republican forces, in fact they operated quite independently of their Spanish allies and if the Russians and the Spanish happened to co-operate it was a matter for some congratulation. The Russians had a number of political commissars in Spain to see that instructions from home were carried out and that the personnel were not inclined to get too friendly with the natives.

The Russians very early in the war sent SB-2's to Spain, where at first they were mistaken for Martin B-10's, which caused quite a stir at the time, many people thinking that America had supplied Martin aircraft to the Republican forces. The SB-2's did quite well at first, being as fast as the fighters sent up to try to intercept them, and considering that the SB-2 had only been in service in Russia for a few months it seems to have behaved itself very well. It was not until the Condor Legion introduced the Messerschmitt Bf. 109B that the Franco forces could do very much about the fast flying Russian bombers.

The other Russian bombers to carry out operations in Spain were the aging R-5's. Nicknamed "Natasha," these machines were used as light bombers and for reconnaissance work. When met by He 51's and Fiat C.R. 32's however, they were soon proved to be quite out of date and what few machines were left were withdrawn from operations.

Once the Condor Legion brought to Spain its most up to date equipment the Russian contingent was in trouble. The I-15's and I-15bis fighters were no match for the fast and better armed Bf. 109B, while they could barely catch the Heinkel He III bombers that they were expected to catch and shoot down. The Junkers Ju 87A, a few of which arrived in Spain, would have been equally difficult to catch. This left the I-16 as the only machine that the Government forces could rely on to act as a useful fighter. Even the I-16 did not show up in a very favorable light when up against the Bf. 109B and, in the last few months of the war, the Fiat G. 50. But a production line to build I-16 fighters was set up at Jerez de la Frontera, although at the end of the war production had only run to about thirty machines, some of which were two-seat trainers.

It is difficult to say whether the Russians gained very much from their massive aid program to Spain. Had the air units co-operated with the ground forces properly, much more might have been achieved, but as it was the whole show was more of an operational experiment to try out tactics and equipment in war conditions and thus gain valuable experience. While the experience was gained, it was at a considerable cost, no less than 500 I-15 and I-15bis fighters, 475 I-16 fighters and 210 SB-2 bombers had been sent to Spain, as well as small quantities of other types such as the R-5 and R-6 and a few naval machines at Cartagena. They did have the opportunity to examine the latest Ger-



The very well known Polikarpov I-16 fighter, which was built in very large numbers, being in service from 1935 until 1943.

man and Italian machines when one of these was shot down, of course, and this may well have provided useful information on the latest techniques in use then, in both Italy and Germany.

Probably the most successful Russian operation of the Spanish Civil War was at Guadalajara in March, 1937. About 115 aircraft of the Loyalist Air Force attacked an Italian column moving along a road where there was little cover or opportunity to escape. The Soviet Air Force was also active at Brihuega, Jarama, and of course, Madrid. There were many air raids on Madrid, which was under seige for over two years and the Spanish Loyalist Air Force did what it could to cover the city.

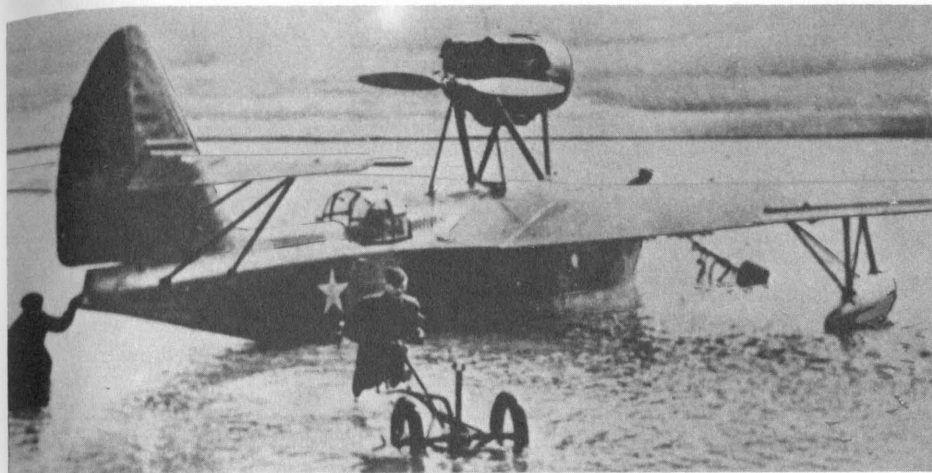
Once it became obvious that the Loyalist side was not going to win the war, the Russians began to lose interest and the "volunteers" began to go home. No further aircraft were sent out and the number of serviceable machines left at the end of the war was not high. Out of the 475 I-16's sent to Spain 416 had been destroyed, either in accidents or in combat. Most of the I-15's had become casualties and many of the SB-2's were out of action for one reason or another. Oddly enough some of the I-16 fighters were in Spanish service for another ten years, the last one being retired in 1952!

Russian interest in armored ground attack machines seems to have become more active about this time and it seems likely that this was a result of practical experience in Spain. Many of the personnel returning from Spain did not get the heroes' welcome that they expected, as many of them were considered by the Soviet security system of the day, the N.K.V.D., to be politically unreliable; many therefore were arrested and quite a large proportion were shot.

The Great Terror

Terror was no new weapon in Russia. The Czar's secret police had been active throughout Europe, but on the whole they operated on a scale that was modest next to what was to come. The first death camp under the Bolsheviks was set up at Kholmogori, near Archangel, in 1921, and by the following year there were 65 camps set up, most of them only internment or labor camps, it is true. All through the twenties these camps had been kept fairly busy although there was no large scale purges or anything of that sort. Even in the days of deliberate starvation in 1930-32 the camps were not very busy, starvation and disease doing the work for the G.P.U. very much cheaper than they could have done it.

It was in 1934 that the newly formed N.K.V.D. ordered the assassination of an old party member named Kirov. This was the signal for mass arrests on such trumped up charges as being an enemy agent, an agent of Trotsky (who was then abroad), of being an enemy of the people, sabotage, etc. There were show trials, successive rounds of arrests, beatings, torturings, and of course mass executions. Anyone whom Stalin considered to be a possible rival was arrested on some charge or other, with the N.K.V.D. adding masses of names to the lists. Yagoda, chief of the N.K.V.D., removed anyone who could be a



The Beriev MBR-2 short range flying boat was in service for much of the thirties and throughout the war.

menace, either to Stalin or to himself.

In Berlin Hitler and his gang of thugs watched this going on with glee and considered how to turn this to their best advantage. In the end documents were forged showing that the German and the Russian staffs had been considering removing their respective political leaders in a communal plot. These documents were prepared under the eye of Heydrich and Behrens of the S.S. and were fed to the Russians by a devious route. Stalin and the N.K.V.D. accepted the documents as genuine, and the result was a massive purge throughout the armed forces. The Army Chief-of-Staff Marshal Tukhachevsky and the Chief of the Air Force, General Jacob Alksnis, were both quickly arrested and shot.

During the years 1937-1939 most of the forces' high command were removed and, if they were lucky, they only faced years of their life in an Arctic camp; the others were shot. The figures make terrifying reading: 3 out of 5 army marshals were shot, as were 14 out of 16 army commanders and 8 out of 8 admirals. Sixty out of 67 corps commanders were arrested, most of them getting shot, as did 136 out of 199 divisional commanders, and so on down to the most junior officers. All told about 35,000 officers were shot. How pleased Hitler and Himmler must have been. Imagine the damage done to the remaining army. No officer would be prepared to voice an opinion or think for himself for fear of what might happen. Needless to say all the officers who were arrested were the clever ones, the ones that had helped to develop the airborne army idea, the long-range bomber generals, and the tank enthusiasts.

It was not only in the Soviet armed forces that the purges continued however. Seventy-five out of the 80 members of the Supreme Military Soviet were

liquidated and the purges went right through industry as well. Somebody remembered the disaster that overtook the K-7 bomber prototype and the designer Kalinin disappeared. Even Tupolev was reported as arrested, although he cannot have stayed under arrest for very long.

Throughout Russia arrests were made and, after torture and "confessions," sentences of death or of long years in the camps followed. Between January 1937 and December 1938 there were 7 million arrests and the luckless prisoners went to join the 5 million already in the camps. During this period a million were executed in the camps and a further 2 million died as a result of the conditions in the camps. At least 10% of the prisoners died each year in all of the camps. The results of the reign of terror were many. The armed forces were denied most of their best men and there followed a long period of reorganization.

In Russia, as in all the other countries, the last few months of peace in Europe were spent in building up their armed forces, in seeing that the air forces had the best possible equipment for the coming fight, and trying to see to it that the country was as well defended as it were possible to make it.

As a result of the purges and fresh instructions about the role of the air forces, far more attention was paid to close support aircraft, more and better fighters and smaller long-range bombers. The result of these fresh lines of thought were soon to be seen in the shape of the prototypes for the Il-2 "Sturmovik" armored attack planes that were to become war winners. A two-engine fighter requirement that was eventually decided against produced the Yak-4 light bomber-reconnaissance machine that was built in small numbers and the VI-100 designed by a team under Petlyakov, which, after various changes of official minds, eventually became the Pe-2, another machine to be built in very large numbers. A long-range bomber had in the meantime been designed by Ilyshin, the TsKB-30, later to become the DB-3 and even later the DB-3F or Il-4, which was to become the chief long-range bomber in use in the Second World War.

The SB-2 series was developed into the SB-2bis, which was somewhat faster than the original design and the ANT-58 was produced which was to be a replacement for the SB-2 series, but this machine had rather a long time spent on it during trial flying and it was not ready until 1942, when it was put into production as the Tu-2.

Much research was being done at the various institutes as well as at TsAGI on pressure cabins for high flying planes, rocket projectiles for attacking tanks, rocket propulsion and even jet propulsion; although in the realm of jet engines the Russians were well behind the experiments in England and Germany.

There was a whole range of planes built, many excellent in their way, that did not get put into production for one reason or another. Machines like the Grushin MAI-3 tandem-wing light attack machine, or the Bakshayev LIG-7 extending wing airplane built at Leningrad. This was to test the principal of

the extending wing, the RK-1, which was to have had one engine, tandem wings and a normal tail unit. The extending wing, when "out," covered both of the tandem wings, while the ailerons, which were only on the rear wings, worked with the wings extended or not. The undercarriage was to retract into the fuselage, and a top speed of 455 m.p.h. was expected, which seems a bit optimistic for 1939-40!

Then there was the BOK-I and the BOK-II both high altitude research planes with pressure cabins based on the ANT-25, and the rather fantastic DB-LK. This was a twin fuselage, twin-engined light bomber with a slightly swept-forward very tapered wing. A fin and rudder was fitted to the end of each fuselage with the tailplane fitted between the two. The engines were radial M-87B's each giving about 950 h.p. The span was 70 ft and the length 32 ft 10 ins and the maximum speed was about 302 m.p.h., and although a prototype was built the machine was not put into production.

The Far East

All through the twenties and the thirties the Japanese had been straining to conquer as much of China as they could. Japan had occupied Manchuria and Korea and so did not want the Bolsheviks near there. They stayed until 1922. The twenties in China were a time of revolution, however, and this made Japan think in terms of intervening, however unpopular this might be to other states in the Pacific area. Manchuria was re-occupied in 1931-32 and this made the other powers in the Pacific look at Japan and wonder what was coming next. Manchuria gave Japan the raw materials that she needed and was a useful starting off point for further operations in China, when these were considered to be advisable.

In 1937 the Soviet Union signed a pact with China and sent military aid in the form of men and equipment for the army and also air force machines. This, as well as the failure of Chiang Kai-shek to defeat the Chinese communists, meant that the Japanese had to face considerable communist forces in China and this Japan did not like.

Japan invaded China in July, 1937, and it was soon obvious to all that Japan had learned all the lessons about aerial warfare. Japan's bombers, frequently escorted by up-to-date fighters, ranged over China and did more or less as they would. Various countries had sent China aid in one form or another, and volunteer groups were in action, chiefly flying somewhat dated fighters trying to fend off attacks by large numbers of more modern Japanese planes. By 1938, much of the Chinese defense was being conducted by the Russians, who had sent over 300 machines into the area. These were mostly I-15 fighters, some DI-6 two-seat fighters, and some SB-2 bombers with some TB-3's sent as transport machines. When the I-15's and the I-152's found themselves in combat with the Japanese Army Nakajima Type 97 (Ki.27) fighters they were outclassed in every way; it was only when the new I-153 with more power and a retractable undercarriage came on the scene that things improved, although

the Russian fighter pilots had a hard time of it until the I-16 arrived.

As in Spain, Russia supplied China with only the bare minimum, never enough to make victory at all certain. China was not allowed a say in the conduct of operations, the Soviet Air Forces being only responsible to their own high command.

The first battle of any size that took place between the two air forces was during the Chang-ku-feng Incident, which was near Possiet Bay. The Japanese Army having bogged down in China they decided to test the Russian defenses on a hill, the ownership of which had been in dispute for a long time. For about 10 days in August, 1938, a furious battle ranged, the Russians employing large numbers of aircraft to strafe the Japanese troops. Russian sources say that "hundreds of Soviet aircraft" were engaged.

Another big battle was at the region of Khalkhin-Gol, near Lake Bui Nor, which is in Mongolia. Here, from the middle of May until the middle of September, the Russian and Japanese troops fought along the border territory. The Japanese reportedly lost many planes in this theater, as many as 600 being quoted while the Russians admit to losing 143. Much the same aircraft were used on these operations, where the Russians used aircraft *en masse* in tactical support of their infantry. On at least one occasion TB-3's (or more probably G-2's, the airborne forces transport version) were used to drop supplies and fresh troops to units that were cut off by the Japanese, and this is almost certainly the first use of this technique in war. Most of the work done in these battles seems to have been ground support and no long-range bombing of the Japanese supply lines or targets away from the battle area seems to have been attempted. As only SB-2's and TB-3's were available perhaps this should not surprise us. At any rate the Russians seemed to have convinced the Japanese that it would not pay to try it on any further.

Poland — 1939

Once Hitler decided in the Summer of 1939 that the next country that he would grab would be Poland, it became necessary to form some kind of understanding with the Soviet Union. There was quite a risk that if the Russians saw Poland falling to the Nazis, the sworn enemy of Communism, they would think that they were about to be attacked and might start a war which, at that time at least, would be inconvenient. Stalin was worried about the dangerous situation that was building up and approached Britain and France to see if some sort of allegiance might be arranged, but both countries had other things on their minds at the time and were very slow in doing anything about Stalin's offer. Stalin then turned to Hitler and the two dictators came to an agreement, which was signed on August 23, 1939 (to the astonishment of the world), by which the two sworn enemies agreed not to attack each other for a period of ten years. By the same agreement Poland was divided into two regions, the western region going to Germany and the eastern area being allocated to Russia.

On the 1st of September Hitler struck at Poland and in a few days the Polish armies were in retreat. The combination of the Panzer armies and the Stukas and waves of bombers and fighters of the Luftwaffe were more than the relatively weak Polish army could stand. The Polish Air Force put up a brave show but it was outnumbered from the start and with all its air fields under constant attack it really had little hope.

Once it was obvious that the Polish armies were in no state to resist, the Russian armies moved forward to occupy the area agreed with Hitler a few short weeks before. The air force units attached to the Red Army that moved forward into Poland had a very easy time of it, as the Polish Air Force had ceased to exist with only a few scattered units still managing to fly. The main units of the Polish Army surrendered on October 5 (although some guerilla units fought on through the winter).

This rush into Poland, with an eye to further possible annexations in the Balkans, was to cost the Russians dearly, as it involved leaving behind a series of positions between Pskov in the North and Odessa in the South that made up the Stalin Line which had been started under the late Marshal Tukhachevsky.

Finland — 1939-40

Having seen what the German armies could do in the way of rapid advances, the Russians became even more worried than they had been previously about the defenses of Leningrad. They felt that if the Finnish border was pushed back about 20 miles, Leningrad would be safer, and they wanted to lease the port of Hanko at the entrance to the Gulf of Finland. The Finns would not agree, however, and in the end Russia decided to take what she wanted by force.

On the 30th of November 1939, the Soviet Air Force bombed Helsinki having given no warning whatsoever that an attack was coming. The Russians were learning from the Germans in some things at any rate! The Russian army units that then advanced into Finland found that the forests and marshes made a very poor country in which to practice the mass frontal advance that was their favorite method of attack at that time. The same forests made close support by the Air Force almost impossible as all that the aircraft crews could see was trees. Liaison between the ground and air forces was not very good and so many of the close support sorties flown were wasted as the aircraft could not find the targets. Poor navigation probably was a factor here, but none of the world's air forces were very good at navigation at this time. The Russians were using very much the same old type in Finland that they had been using for a long time: TB-3 bombers, SB-2 light bombers and some of the newer DB-3 twin-engined bombers, along with the usual I-15 series fighters and I-16 fighters. It is reported that some I-17 fighters were also used in this campaign but as only a very few of these machines were built it seems rather unlikely. R-5 light bomber biplanes were even used and it is hardly

surprising that the Finnish fighters, outdated though they all were, were able to cause heavy casualties.

The Red Army had a much harder time than was expected because the terrain was not suitable for the kind of war that it was trying to fight, and the air forces units were having great difficulty in backing them up. The bomber units, on the other hand, were bombing many of the Finnish towns with what seemed to be a complete disregard for the civilian population, although to be fair this may only reflect a poor standard of bomb-aiming. (Most bomb sights in use at the beginning of the forties were very difficult to operate accurately under war conditions as they all depended on the airplane flying straight and level while approaching the target. This makes the bomb-aimer very unpopular when there is anti-aircraft fire and fighters about. The first bomb sight that got around this difficulty was the British Mk 14, but under ideal conditions it was not quite so accurate as the American Norden.)

By March, the superior numbers of the Red Army were beginning to tell and the Finns had to sign a peace treaty with the Russians, giving the Russians what they wanted. The Russian Army had shown itself to be clumsy in its tactics and the Soviet Air Force had not done much better. About 2,000 planes were committed to the war, and of these about 25% were lost, which is not very good when you consider that the best fighter the Finns had was the Gloster "Gladiator." Much of the blame can be laid on the leadership, and this had not recovered from the purges a year or so earlier, but many of the losses in the Soviet Air Force were almost certainly caused by the poor flying conditions in the area during the Winter and flying from ice-bound air fields.

The Russians gained much valuable experience however, and one suspects that as a result of experiences gained in this little war the Russians accelerated their re-equipment program which was already under way. They probably at last realized that quantity without quality was no good, and that many of their planes had been in service too long.

The Design Groups

For a long time it was obvious to everyone in the aircraft industry that the TsKB was greatly overworked, and several design groups had already been detached from TsKB and sited either near or actually at one or another of the aircraft factories. About 1940, this process was encouraged and the result was a decentralization that was in many respects a good thing. At the same time a new system was started in the designation of Russian airplanes. No longer was the plane identified by its purpose; it was not identified by letters to show the design group that was responsible for the original design. The letters and numbers were allocated by the Air Force so that, still, a plane would have two sets of letters and numbers, the Air Force set and the design group numbers. On the whole the Air Force issued odd numbers for fighter aircraft and even numbers for all the rest.

There are exceptions of course, sometimes numbers are issued out of sequence, and other cases occur where a number is issued twice. The Yakovlev

group are noted for their exceptions to the rules, for instance there were two designs called Yak-25, and two designs called Yak-30, while in 1950 and for a year or two afterwards there were several machines that were completely out of sequence, such as the Yak-50, the Yak-200 and the Yak-1000. But once they started (and some groups were using the old system up until at least 1944), most of the design groups settled down to this system and it became easier to sort out all the different makes by their design group numbers.

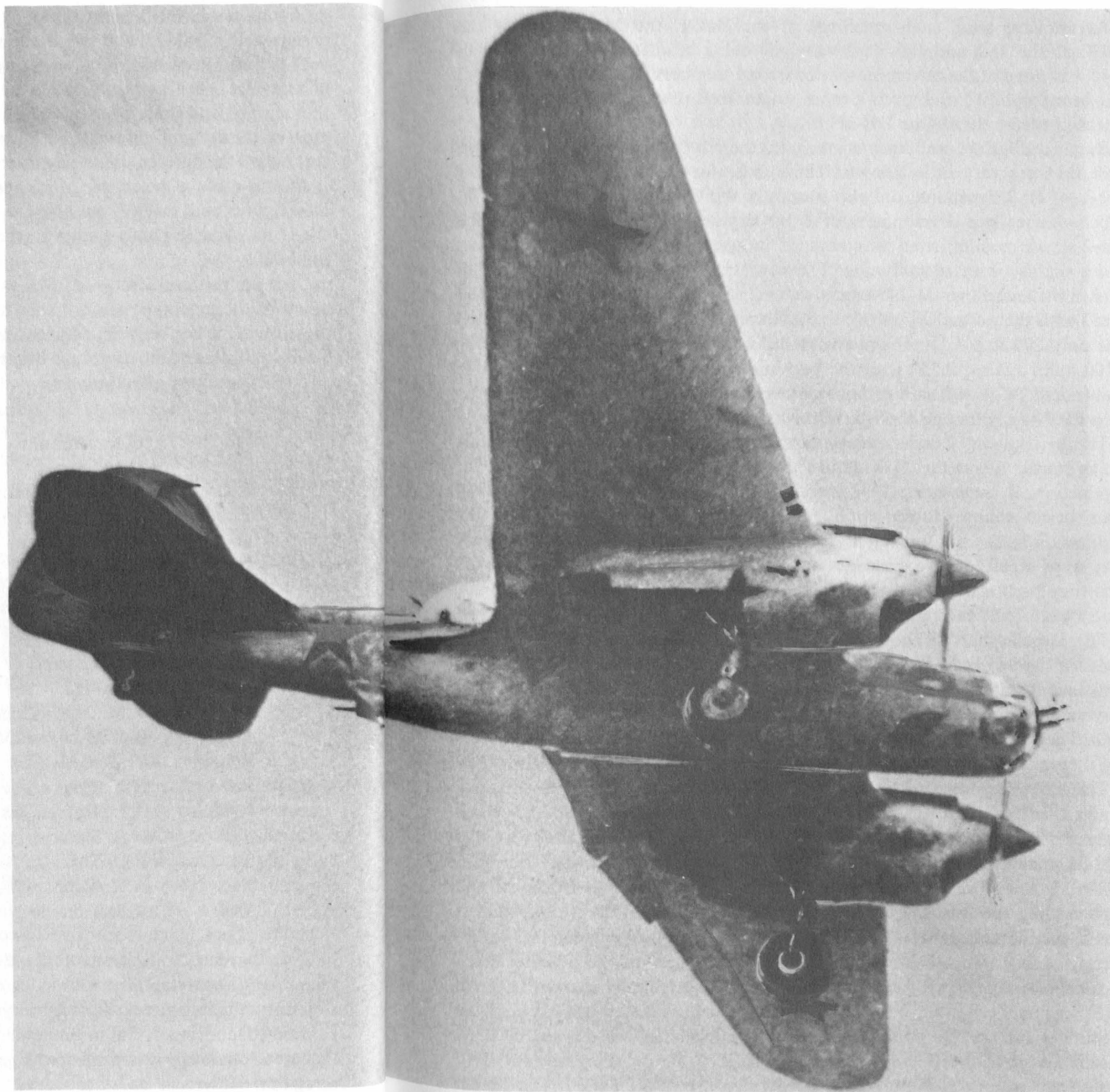
Just to confuse the reader, if he needs confusing at this point, the Sukhoi Su-3 fighter built in 1942 was also the I-360; while the Su-5, built in 1945 was the I-107. And to confuse even further, our old friend the MiG-15 was also the I-310!

Civil aircraft are always known by the design group number and so are many of the prototype aircraft that have not been put into production and therefore have not been issued with an Air Force designation, for example the Tu-104 airliner and the prototype bomber Tu-85.

The letters most often seen are:

An	O.K. Antonov
Be	G.M. Beriev
BICb	B.I. Cheranovsky
Er	V.G. Ermolaev (can be spelt Yermolaev)
G	V.K. Gribovsky
Il	S.V. Ilyushin
K	K.A. Kalinin
Ka	N.I. Kamov
La	S.A. Lavochkin
Li	B.A. Lisitsin
Mi	M.L. Mil
Mya	V.M. Myasishchev
MiG	A.I. Mikoyan, M.J. Gurevich
Pe	V.M. Petlyakov
Po	N.N. Polikarpov
RAF	A.N. Rafaeliants
Sh	V.B. Shavrov
Su	P.O. Sukhoi
Tu	A.N. Tupolev
Yak	A.S. Yakovlev

With the decentralization of the designers, some thought was given to the moving of the factories into safer regions behind the Ural mountains, away from possible attack, but not very much was done at this stage as it was considered more important to get new equipment moving to the Air Force units that were obviously going to need them in combat soon, either in the East or against Hitler.



The Tupolev SB-2bis which was the standard medium bomber in Russia from about 1938 until 1942.

As we have seen, such machines as the Yak-1, the MiG-1 and 3, the LaGG-3, the Il-2 and the Pe-2 were all being readied for production in 1940, but none of them were in service in any numbers at all, while the DB-3 was being modified and given a more streamlined nose without a gun turret, when it became the Il-4 or DB-3F.

But as well as the well known machines there were many others that were built that are very little known. There was, for instance the Yermolayev Yer-2 (or Er-2 depending on who translates the Russian name into English) which was really a development of a two-engined transport, the Stal-7. The Yer-2 was a medium sized twin-engined bomber with twin fins and rudders and a slightly inverted gull wing. The wing span was 67 ft 7 ins, the length 52 ft 6 ins and either M-105 engines or ACh-30 diesels were fitted. The top speed with the normal M-105's was 310 m.p.h. but with the diesels the speed was only 200 m.p.h., although the range was better with the diesels, being 3,100 miles against 2,550 with the gasoline engines. The Yer-2 is very little known and yet it was built in fair numbers and used for long range bombing with the Il-4's, although there were far more of the Il-4's.

The best-known Russian heavy bomber of the war period is the TB-7, which started life as the ANT-42, but as it was engineered by Petlyakov for production, it became the Pe-8 in service. This machine was the victim of many design changes forced upon it by the Soviet Air Force, which kept the production lines from flowing as well as they might; and anyhow the powers that were seem to have been quite happy with the Il-4's and the Yer-2's that they had, and which were easier to build in large numbers. About 200 Pe-8's were built each year during the war.

The Tupolev bureau had had another try at building a long range flying boat for the Soviet Navy, the ANT-44, which became the MTB-2 in service. This looked rather like a gull-winged Short "Sunderland" and was built in very small numbers, in fact it is believed that only the two prototypes were built. These machines were used by the Soviet Navy in the Black Sea area during the war.

There were several interesting fighters designed and even built in the early forties that never got put into production, for one reason or another, such machines as the twin-engined MiG-5 fighter, the heavy escort fighter with two AM-37 engines designed by Polikarpov and the very interesting little IS-1 (I-220). This last machine was an attempt to combine the short take-off and slow landing speed of the biplane with the high speed of the monoplane! It was a small shoulder-wing machine with a radial M-63 engine, the undercarriage being mounted on the lower wing. After take-off the pilot retracted the undercarriage which folded up into the fuselage, slightly like the Gruman F3F-1, while the bottom wing also retracted, partly into the fuselage and the remainder into the top wing! All this misplaced ingenuity was devised by V. V. Nikitin and V. V. Shevchenko, and it would seem that the thing actually flew. A second version was built, but no production order was placed. The weight

penalty of all the retracting mechanism, the hinges etc., must have been excessive for a small fighter, but it should go down in history as a gallant try.

Another interesting prototype built at this time was the Bolkhovitinov "S" which was a twin-engined light attack bomber. The design feature that made the "S" so interesting was that the engines were mounted one behind the other, driving co-axial propellers, making the machine look like a rather long single-engine type. Twin fins and rudders were fitted to give the rear gunner a good field of fire. With a wing span of approximately 48 ft and a length of 43 ft 4 ins and very clean lines the "S" had a top speed of 354 m.p.h. and a bomb load of about 800 lbs; but the transmission for the rear engine gave constant trouble and eventually the rear powerplant was removed. The plane was then underpowered and so tests were not continued. Bolkhovitinov, incidentally, was the designer of the four-engined craft called the TB-6 in the West during the war, and which was really the DB-A, only a few of which were built.

Polikarpov has also designed an anti-tank airplane the VIT-1, later developed into the VIT-2, which was a small twin-engined plane with four 37 mm cannon mounted in the wings and very pleasing appearance; and although 30 of these are supposed to have been built and delivered to a special anti-tank unit, it is not known if they were actually used on operations.

Rockets in Russia

Rocket research started in Russia in the late twenties, rather as it had in Germany and Italy. In 1930 an engineer called Dudakov at the Gas Dynamic Laboratory at Leningrad had fitted a TB-1 with gun powder rocket boosters and shortened the take-off dramatically, allowing a greater take-off weight to be permitted. Sergei Korolev, senior engineer at TsAGI visited the establishment at Leningrad and saw the TB-1 and its rocket-assisted take-off. In 1933 a Jet Propulsion Research Institute was set up (called the RNII) and Korolev was made deputy director. Various advanced rockets were built and experiments were being carried out with liquid fuels so that the Russians were really about as far advanced as the Germans in this field in the mid-thirties. The liquid fuel rocket motors were being developed under L. Dushkin and by 1939 the researchers were thinking of building a rocket-propelled glider. Korolev designed a glider, the SK-9 and when the rocket engine was fitted, the machine became the RP-318. On February 28, 1940 the RP-318 was towed to an altitude of 8,500 ft, and then cast off. Within a few seconds the rocket plane was gaining altitude fast and accelerating so quickly that the test pilot Fyodorov was forced to stop the engine, the towing plane, an I-5 fighter having been left far behind. The thrust of the engine in this case was only 310 lbs and Dushkin was soon working on a larger unit, expected to give about 3,000 lbs thrust. At the same time that Dushkin was working on his new engine, an aerodynamicist called Berezhnyak suggested to Bolkhovitinov at the Soviet Air Force Academy that they should build a rocket fighter. This suggestion was approved and work began under Berezhnyak and A. M. Isaev, the resulting

airplane being called the BI.

It was first tested as a glider, much as the Me-163 was to be. First taxiing trials were started in May 1942 after the first engine exploded in the prototype. The BI was a very clean, very small airplane with a wing span of only 21 ft 3 ins and a length of 21 ft. Two 20 mm ShVAK guns were to be carried in the service version of the little fighter. Various troubles arose, as is to be expected in the development of such a machine, but trials were going well until a test pilot was killed in March 1943.

Shortly after this, the Air Force authorities lost interest in the rocket fighter, even though the BI was expected to have a top speed of about 600 m.p.h. (and had actually done nearly 500 m.p.h. on test), and the production of the 50 BI's that were ordered was cancelled, only about 7 being finished.

Two other rocket fighter projects that were being developed at the same time were also cancelled, one was the I-302, designed by Tikhonravov, and the other was the "Malyutka" designed by Polikarpov. By the summer of 1943, the Russians had given up all work on rocket fighters, just about the time that the German program was getting under way.

The Russians had continued their work on small rockets, however, and these were developed as anti-tank weapons. There were two rockets made to be carried by aircraft, the RS 82 and the RS 132 missiles, both used by the Il-2 when it started to come off the production line in 1941. The RS 82 was also carried later in the war by fighters engaged in tactical support work, the La-5 carrying three under each wing.

Hitler Looks East

It is not certain when Hitler decided to attack the Soviet Union, but it was quite certainly in the summer of 1940, about the time that the Luftwaffe was not winning the Battle of Britain. The German Army Staff had been preparing plans for the attack on Russia since August 1, 1940, and by December Hitler issued his Directive No. 21 which stated that the Wehrmacht must be able to start the lightning campaign against Russia by May 15, 1941.

But something went wrong with Hitler's calculations. Mussolini had become jealous of the German conquests and decided to have a go himself. He invaded Greece in October 1940, and the Italian army soon found itself in trouble, being chased out of Greece and Albania. Hitler had to send forces to help and the result was that the German forces eventually had to occupy the whole of the Balkans and even invade Crete, which was not in the original scheme of things at all; neither was the North African campaign. All this delayed the German plans, and the invasion of Russia, planned for May 15 had to be put back to June 22. This was one of Hitler's biggest mistakes.

British Intelligence had got wind of the planned invasion by March 1941 and a warning was sent to Stalin in April; but Stalin chose to think of this as a capitalist trick and, so far as we know, he ignored it and did nothing about it. This is possibly excusable as Russia and the West were not on very

friendly terms at the time, but what was totally inexcusable was that Stalin chose to ignore the warnings of his own intelligence service, which even then was very extensive and efficient.

Both the "Lucy" spy ring operating in Switzerland, and the set up in Japan working under the famous spy Richard Sorge, sent much information to Moscow concerning the coming invasion. The information sent was factual and accurate, and had it been acted upon the whole course of history could have been altered by those wireless messages; but the Russians chose to ignore them all, being suspicious that it might be a plant by the German intelligence, the Abwehr. On May 12 the Sorge group in Japan sent the following: "One hundred and seventy German divisions massed on Soviet border will attack along whole of frontier June 20 main direction of drive—Moscow."

And Moscow did nothing.

Operation "Barbarossa"

At dawn, June 22, 1941, the Wehrmacht struck. The forward units of the Red Army were asleep, literally, and were overrun by the Panzers which were advancing at an almost motor tour speed. So surprised were the Russians that vital bridges were not blown up because the Germans were across before the orders to blow the bridges could get through. The Russians were paying for their greedy rush forward into Poland, with little in the way of prepared defenses and the unfinished Stalin Line some three hundred miles behind them, unfinished, unprepared, and unmanned.

The Soviet Air Force was just as unprepared, being in the unenviable position of being unwarned, too far forward and with many of its aircraft at the end of their operational life, rapidly becoming obsolete. The forward units were either strafed by the Luftwaffe on the ground or caught in the air by forces which were either better trained or better equipped, and usually the Luftwaffe was both. The airfields in Poland and then western Russia were soon overrun by the Panzers and the Soviet Air Forces were in constant retreat, from base to base, never knowing when their latest airfield would be found and bombed by Stukas that their fighters could barely shoot down, or strafed by shoals of prowling Messerschmitt Bf 109's and 110's. In the first two days of the war the Russian Air Force lost, one way or another, a little over two thousand aircraft.

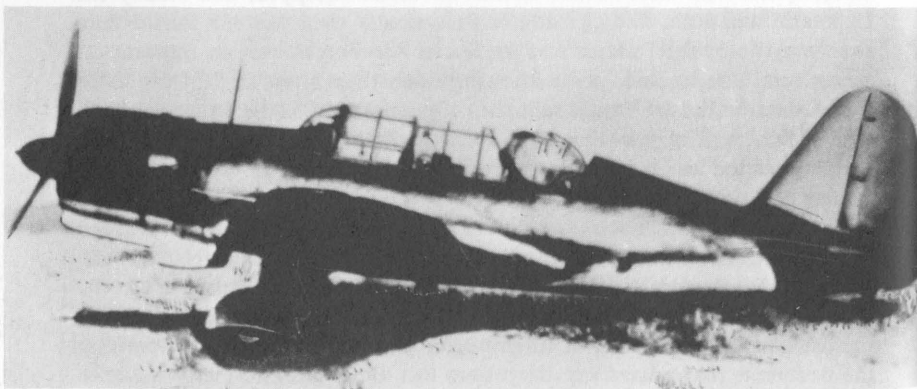
The next few months were dark indeed for Russia. The Germans advanced on every front and the Russians either did not have the time to plan any defensive operations or the lack of trained senior officers (dating from the days of the Great Purge) caused any new units that arrived to be thrown into the battle with no planning or forethought, piecemeal. The results were that the new units that were scraped up were lost almost immediately. Within a week of the attack the Soviet Air Force General in charge of the North West Front, General Rychagov, was under arrest for "treasonable activity", in other words he had been defeated, although the real blame lay in Moscow. After

the first few days the Red Army was deprived of all air cover and the German Army could advance at will with little or no interruption, certainly from the Air Force, although the Red Army was in fact in very little better shape than the Air Force. What really stopped the Germans that year was the weather, which must have made Hitler and his Generals think about the time lost helping out the Italians earlier in the year.

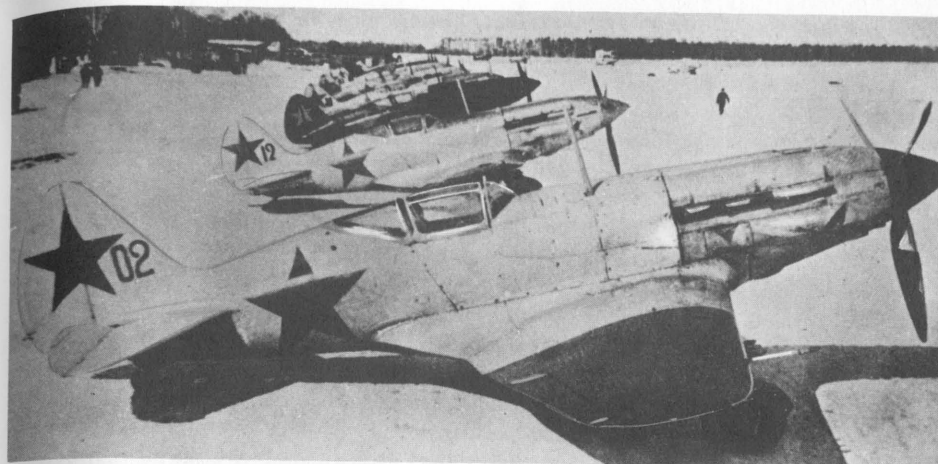
How the Russian generals must have longed to get their hands on the 250,000 trained troops doing guard duty at all the labor and internment camps. Two events that were of importance, however, were the Russian counter attack in front of Moscow in December 1941, even though this was a real scraping of the barrel at the time, and the evacuation of Soviet industry.

There had been vague plans to evacuate key industries in case of war for several years but they had not been taken very seriously as nobody in Russia expected an enemy to advance as quickly as the Germans had been able to do, and so the project did not seem to be of very great importance. But in the autumn of 1941 it was very necessary to send whole factory groups far to the east, out of the reach of both the German Army and the Luftwaffe. Hundreds of trains were needed to rush the factories east beyond the Ural mountains and even into Siberia.

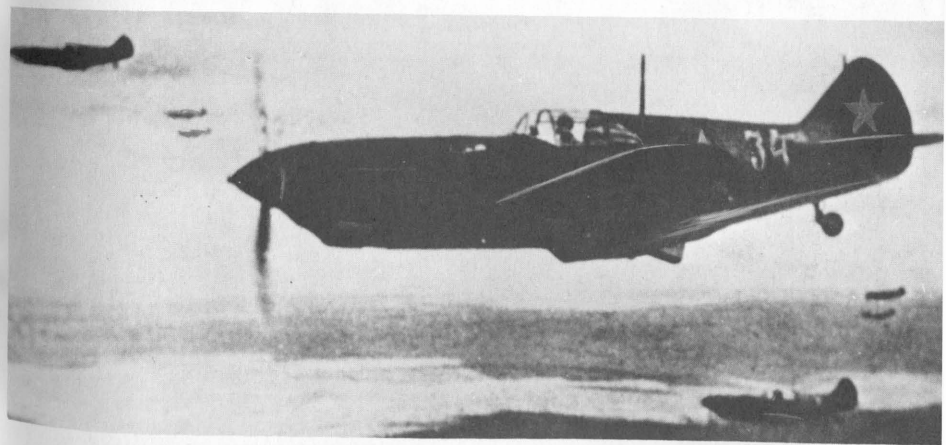
Yakovlev has written of the weeks in the trains on the journey east, trains being sent every few hours packed with personnel, materials, jigs, and tools. It proved possible to get an assembly line going a few weeks after it had been uprooted, in many cases the production line was laid down and the factory literally built round it. The workers lived in wooden barracks that got built as and when it was possible. But the aircraft started to come off the lines and during the winter it became possible to start to build a new, better Air Force. The I-16's were replaced with Yak-1's, MiG-3's and LaGG-3's and these



The Sukhoi Su-2 was designed to replace the Nyeman R-10 light bomber which was rather a disappointing craft. The Su-2 was in service from 1940 until 1942. It suffered heavy losses in the first year of the war.



The well-known MiG-3 fighter. Note the winter color scheme of white but with red outer wing panels. The third machine still has the summer colors.



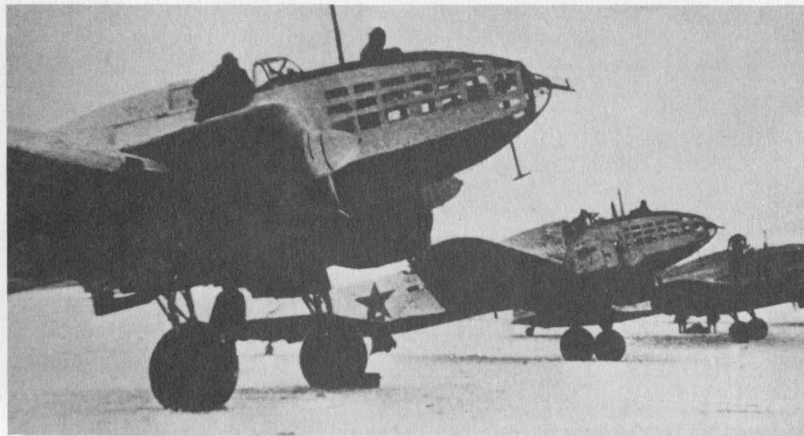
The Lavochkin LaGG-3 fighter, chiefly built of bonded plywood; it was rather heavy and performance suffered.

machines started to appear in numbers. The Germans had found I-5's, R-6's and all sorts of other museum pieces at the airfields that they overran, although we do not know that they were not there on training missions.

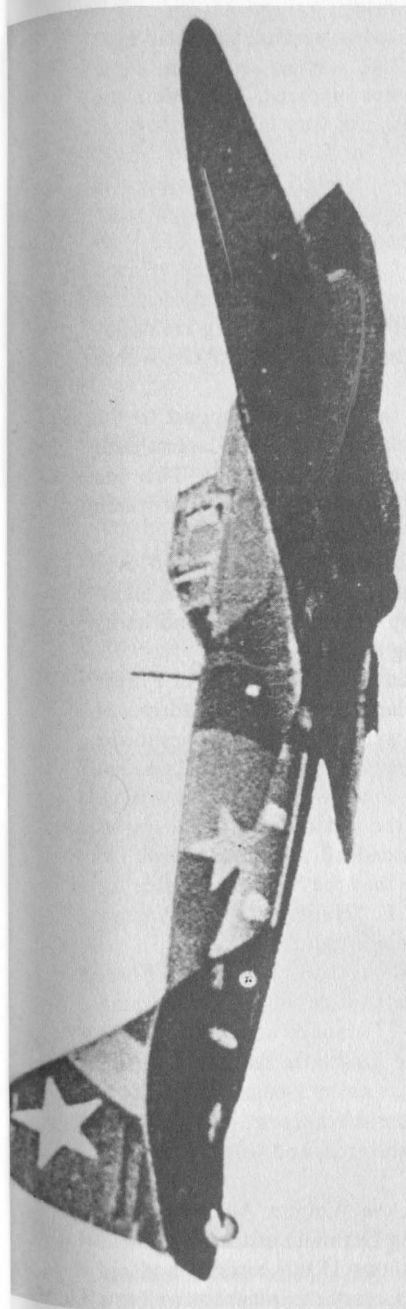
1942 saw the Soviet Air Force building up its strength behind a front line that was more static than the war in the East had seen so far. The Air Force had to support the Army in its big summer offensive but as this was none too successful, depending too much on massed frontal attacks, much of the new strength was lost to no very good purpose. Later, as the battle of Stalingrad started, the Soviet Air units had two jobs; to attack the Panzers and to try to stop the Luftwaffe supplying the German army which was involved in this pitched battle among the factories and houses of the city.

Light planes also supplied the Russian troops when other means failed, Polikarpov U-2's being used for the purpose as they were very maneuverable and easy to fly at night, when most of this kind of operation was carried out. They also dropped bombs on the German troops. But it was really the advances of the Russian armies that stopped the Luftwaffe supplying the German sixth army trapped at Stalingrad late in 1942 as they had made the forward landing grounds unusable. Supplies were parachuted in for a while but by then the Germans had lost most of their transport planes, either to the weather, anti-aircraft guns or to the Soviet fighters.

1943 saw the Soviet Air Force on the ascent at last and with increasing numbers of better machines it was able to give the Red Army proper support. The Il-4's and Yer-2's were doing what they could in the way of long range bombing, but the standards of navigation were not very good and the bombloads carried were not very high, averaging about two to three tons. A few raids on Berlin and other German and Balkan cities were carried out, however.



The Ilyushin Il-4's (DB-3F) long range bombers in winter colors.



Tankbuster! The Il-2 or Sturmovik attack aircraft. Many were built with a rear gunner behind the pilot.



The Tupolev Tu-2 fast bomber, which started to replace the Pe-2 in 1942.

This year saw large numbers of Il-2 "Sturmoviks" in service, also the Tu-2 started to replace the SB-2 in service. The Pe-2 was in service in large numbers and new versions of the standard fighters appeared. These were the MiG-3 in small numbers, the La-5 which was built in very large numbers indeed and the Yak-9 which was also built in very large numbers. The Yak-3 light fighter was also built at this time but not in such large numbers as the Yak-9. Airplanes also came from Britain and the U.S. although what Russia thought of some of the machines she got is not on record. The P-39 and the P-63 were useful as anti-tank machines it seems, while the "Hurricane" was by then too slow of course. The B-25 was probably the most useful machine sent to Russia, while what they thought of the Armstrong-Hawksley "Albermarle" is not on record, probably much the same as the R.A.F., whose ideas on the subject are not repeatable!

By July 1943 the Soviet Air Force was able to give ample support to the Russian tanks in the massive tank battle at Kursk, which was the largest tank battle in history and which sealed the fate of the 4th Panzer Army. This was the last major battle launched by the Germans on the eastern front, after which they slowly went over to the defensive, and were slowly pushed back.

In 1944 the Russians were on the advance throughout the year and over virtually the whole front. There were stops of course, when the Germans counter-attacked, or when the Red Army had to stop to rest its troops and let its supply organization catch up with the advancing troops.

Twice during the year the Soviet Air Force had contact with the Air Forces of the western Allies. They met over Warsaw, when special duty squadrons of R.A.F. Bomber Command operating from Italy were dropping supplies to the Polish resistance fighters. The Russians, while very near, were at that moment exhausted and hard pressed on other fronts and so were unable, or unwilling, to make the extra effort to relieve Warsaw at the last moment. The results are well known, the SS moved in and "abandoned all moral standards" to quote their Commanding Officer, not of course that the SS were notable for having any moral standards at any time. R.A.F. "Halifax's" over Warsaw several times met and were fired upon by Pe-2 night fighters.

In June 1944 the Russians agreed to some of the U.S. Eighth Air Force bombers landing on Russian air fields to refuel after attacking targets normally too far east to attack. The Eighth Air Force B-17's landed at air fields in the Poltava area in the Ukraine, and as soon as the Luftwaffe realized that this was happening the B-17's were shadowed to their eastern bases, and a large force of bombers attacked the fields with considerable success. The Russians "forgot" to allocate sufficient fighters to defend the area, and would not allow allied fighters to operate.

It must be remembered that, in Russian eyes, the Western Allies were not allied to Russia, they just happened to be fighting Germany at the same time. The fact that they accepted, without thanks, about 15,000 aircraft and aid worth about 500 million dollars of materials and factory equipment as well as a



The Petliakov Pe-2 bomber that was Russia's standard tactical bomber during the war.

vast fleet of trucks and tanks for the army, made no difference. The Soviet Air Force had tried to get hold of a number of B-17 and B-24 bombers but very wisely the U.S. did not send any.

By the end of 1944 Moscow was busy planning for after the war, seeing how much of Europe could be swallowed up, by fair means or foul. The Red Army had occupied most of Eastern Europe and the machinery was being set up to take over the various countries that had fallen to them. The war ended in Europe with a huge Red Army occupying half of Europe, with a huge Air Force to give it tactical support, with the best aircraft in the world at the time in the



A light fighter from Yakovlev. This is the Yak-3, a light fighter developed from the Yak-1. The series of Yak fighters, the Yak-1, the Yak-3 and the Yak-9 were all built in large numbers.

support role. The West had nothing like the Il-2 which the Russians had built so many of and which was such a success.

Russian production during the war is something that cannot be quoted with any exactness as one does not know if the stated figures are real figures or propaganda figures. For instance we are told that the Il-2 was built in very large numbers, more than 35,000 is the figure given, while we are told that over 37,000 Yakovlev group single-seat fighters were built. 6,528 LaGG-3 fighters were built, while 2,100 MiG-1's and 3's were turned out. The figure given for the Pe-2 is 11,400 while the Tu-2, which was built for several years after the war was not turned out in such large numbers during the war, about 1,500 being the likely number. The total figure for the whole industry during the war is given as 170,000 airplanes and 275,000 aero engines, which sounds a bit high as in 1944 they produced about 40,000 machines. The author estimates that a figure of about 130,000 planes may be a fair number.

By the end of the war in Europe the Russians had grabbed half of Europe, a high percentage of the German aircraft industry, which had been moved east to avoid the allied bombing, and had fallen behind with aviation research and the development of new ideas.

The Soviet Air Force in the Jet Age

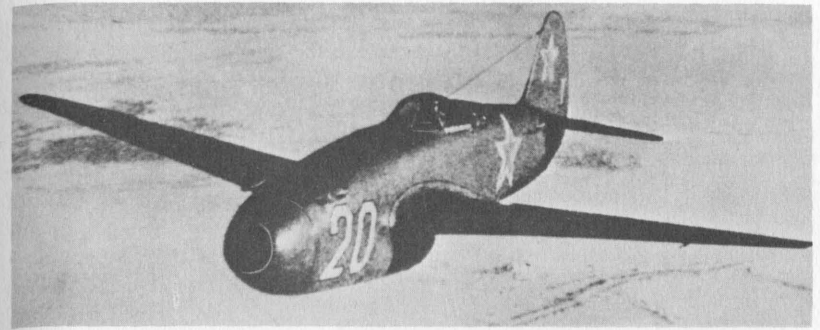
Close behind an invading army in the twentieth century come the intelligence units, each one with its list of targets to investigate. So it was in 1945 when the Red Army was advancing through eastern Europe and into Germany. Behind the combatant troops came large numbers of technical intelligence units each one looking for its own targets of interest. They found rich pickings, especially the Air Force intelligence teams, when they found the German factories that had been moved east to avoid Allied bombing.

They found examples of nearly all the advanced prototypes that the Germans had been working on for the last year or so, with many examples of the Me 262, the He 163 and various Junkers machines ready to fly. They found the prototype Ju 287 four-jet bomber, together with the more advanced second machine and the production line almost ready to go. Later, in 1946-47 the Ju 287 prototypes were flying in Russia. Much of the work and drawings of many advanced projects that the Germans were working on was captured as well, and all this was investigated by the intelligence men and sent back to Russia, where it was received with some dismay.

Engines too had been captured in large numbers and especially the Junkers and B.M.W. jet engines were all sent back to Russia for evaluation.

In Russia, when all this material started to flood in, the first feelings were almost of disbelief. The Russians were incredulous that in such a war, under constant attack and with defeat staring them in the face, the Germans had been able to produce such planes and such projects so far in advance of their own current thinking.

A crash program of building jet fighters was set in hand, at first using captured German jet units, chiefly the Junkers 004 which was produced



Developed from the Yak-3 and fitted with Russian built Junkers 004B (called the RD-10 in Russia) the Yak-15, was the first jet fighter to go into service. From the Yak-15 was developed the Yak-17 with a nose wheel undercarriage, more angular fin, and the more powerful Yak-23.

for a while as the RD-10. The first generation of Jet fighters built in Russia were the Yak-15, the twin jet MiG-9 and the La-150 high wing fighter. Sukhoi built the Su-9 which looked rather like an upswept Me 262. The Yak-15 and the MiG-9 were both chosen to go into service, the MiG-9 having a top speed of about 560 m.p.h. while the Yak-15 with only one engine could only manage about 515 m.p.h. This was a start but, at the highest level, this was not considered good enough. Russian planes were being designed that were going to need better engines with more power and greater reliability.

In late 1946 at a meeting at the Kremlin, it was suggested to Stalin that they might try to buy some jet engines from the West. Stalin is quoted as saying: "What fool would sell us his secrets?" The answer came quite quickly. The British Labour Party, then in power, would be more than happy to sell Russia examples of the Rolls Royce "Derwent" and "Nene" which were then considered in England to be not top secret any longer. So, early in 1947, the treasure trove, in the shape of 25 "Nene's" and 30 "Derwent's" arrived, to the joy of the Soviet air industry. While some of the engines thus gained went to power prototypes badly in need of reliable power units, others went to the various factories and research units for study. Soon, copies were being built, the copy of the "Nene" being called the RD-45 and that of the "Derwent" the RD-500, and most of the Russian aircraft industry was preparing designs for new aircraft using the Soviet adaptations of the Rolls Royce engines.

The "Copycat Bomber"

In July 1944 and later in the autumn three U.S.A.F. B-29's landed in Russia, at airfields near Vladivostok, forced down by either battle damage or lack of fuel. The crews, naive fellows, thought that they would have their machines patched up, refueled and be sent off back home. They were soon to

find that the Soviet Union was not at war with Japan, and had no intentions of being at war with Japan until just before the end of the war, when she would have to join the peace negotiations of course! The unhappy crews were interrogated, and interned, treated rather more like prisoners of war than men fighting on the same side.

The three B-29's were pounced on with glee by the technical intelligence of the Soviet Air Force. They soon had the B-29's dismantled and a team of designers under Tupolev were given the job of stripping the components down piece by piece and making drawings of each piece as they did so. Having done this they had the mammoth task of devising a production line to make all the many pieces of the complicated B-29 and assemble all the pieces into the various components that go together to build up a bomber airplane. In the meantime, at another factory, another team was carrying out another crash program of stripping down the Wright R-3350 engines and preparing sets of drawings so that Soviet factories could start building these to power the new "Russian" bomber.

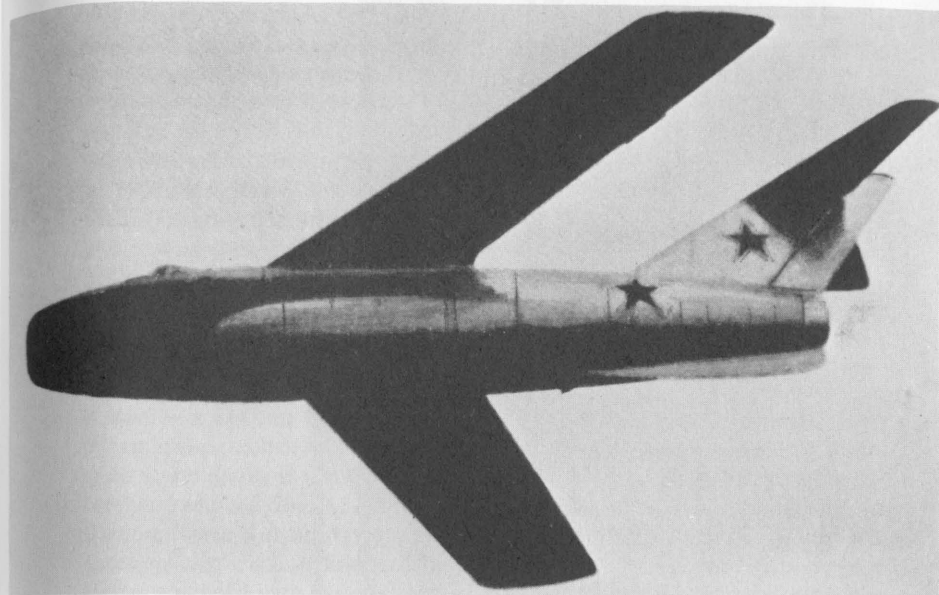
Rumors that Russia was building the B-29 started to leak out of Germany in 1946, and it was later confirmed that in this year Russia tried to buy tires, wheels, and other undercarriage units from the U.S. The appearance of three of the bombers at an air display at Tushino in 1947, at last confirmed the rumors and the story was at last out. Russia had completed a fantastic copying operation and in three years had got an exact copy of the B-29 in production. The new machine was called the Tu-4, while a very similar transport version was called the Tu-70.

The Tu-4 was lighter and less powerful than its American original, but, combined with the atomic bomb, which Russia had developed (thanks to her excellent intelligence service, and traitors in the west) it was a very real threat to the West, and it was built in large numbers, about 1,000 being in service in 1953.

The one thing that the Tu-4 lacked was range sufficient to bomb targets in the U.S. with certainty, and the Tupolev bureau had next to try to evolve something to achieve this. The answer was the Tu-85, a much bigger version of the Tu-4. The wing span was increased to 184 ft while it was 129 ft long. The range was very good, about 7,600 miles but with a top speed of about 355 m.p.h. it would have been rather vulnerable and this giant bomber was not put into service, the Air Force deciding that they could afford to wait for the new generation of turbine-powered bombers that were being developed.

The Jet Age Begins

We left the fighter designers rejoicing over their new Rolls Royce engines, or Russian copies of them; and soon a whole range of new machines appeared, using either one or the other of the two designs. The best-known fighter of this era, of course was the MiG-15 and this was to make its debut in combat over Korea.



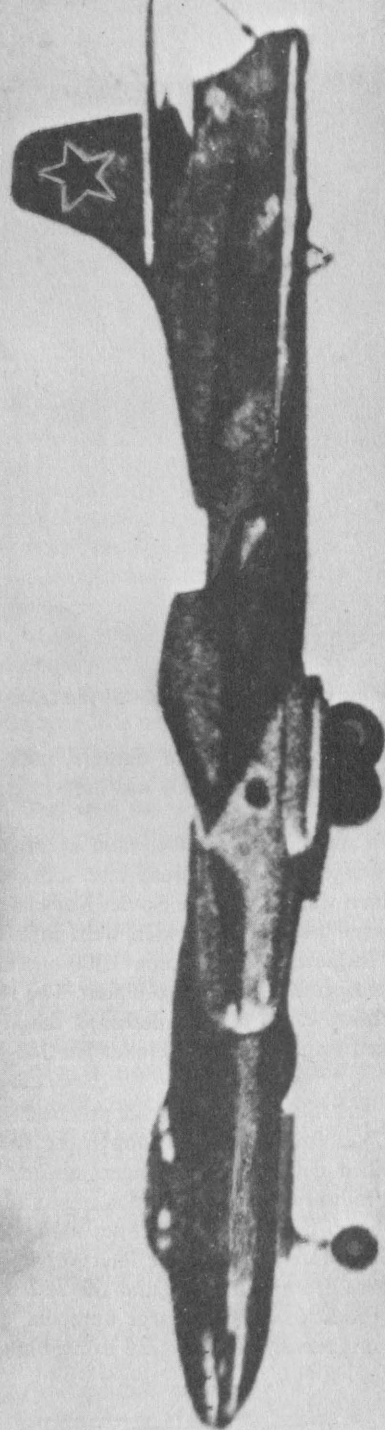
The Lavochkin La-15 jet fighter produced at the same time as the MiG-15. The La-15 was used in small numbers as a close support fighter.

Lavochkin and his bureau produced a whole range of fighters, most of which were not successful. The La-15 ("Fantail" to NATO) was used in small numbers as a close support fighter.

Tupolev had in the meantime been working on a twin, then a three-jet bomber that eventually became a twin-jet again and went into service as the Tu-14, the "Bosun" to NATO, which was used by the Soviet Navy; while Ilyushin had designed the quite pleasant looking Il-28 which went into service in 1949 and was in production for several years, some 3,300-odd machines being built, many being exported; some 500 going to China. The Il-28 was not Ilyushin's first jet bomber, however, as he had designed the Il-22 four-jet machine in 1947, which looked rather like the Heinkel He 343 but was bigger.

So, by 1950 the Soviet Air Force was fairly strong, it had not been run down after the war like most of the Western air forces, although the Berlin Airlift in 1948 had awakened the Allied nations to the dangers ahead. By 1950, the Russians had about 18,000 military aircraft, of which about 1,000 were jet fighters. Of these thousand or so it is likely that about a hundred were Yak-15's and at least two hundred were Yak-17's, the later version of the early fighter. About a hundred were probably La-15's and the rest were MiG-15's which were coming off the production lines in large numbers.

The Tu-4's were in service in fair numbers and Il-22's were being built in



The Tupolev Tu-14 twin jet bomber as used mostly by the Soviet Navy.

numbers so that Russia felt fairly strong. More advanced types were on the way, and the Junkers engine team that was working in Russia were working on a large axial-flow prop-jet engine that was to be very successful.

In the missile field Russia was making good progress, with all the captured material from Germany (the Russians captured Peenemunde remember, and the able direction of Korolev who was a leader in the Russian Rocket field). In 1950 then, Russia felt fairly satisfied, the eastern half of Europe was in the Communist bag, her forces were strong in numbers and fairly up to date and new aircraft and rockets were being developed. Atomic weapons were no longer an American monopoly; if there was a war Russia could expect to hold her own, and her satellites in Eastern Europe were all being equipped with modern equipment so that they could be counted as allies in more than name.

Korea — a Testing Ground

When in the summer of 1950 the Chinese and North Koreans decided to invade South Korea it was done on a carefully prepared plan, worked out beforehand with the Chinese Army, given certain assumptions. The plan assumed that the North Korean Army would be able to occupy all of the South in a short space of time, it assumed that the 150-odd strong North Korean Air Force, equipped with various types of piston-engined Yak fighters and some Il-10 Sturmoviks, would be able to hold their own. The assumption was made that it would take some time for the U.S. Air Force to react, and by the time that it was ready to start operations against the Northern forces the war would be over.

Events proved that calculations in such matters can be wildly out. The North's army was not as quick as was hoped and the close support units of the Air Force of the North was not as efficient as was expected. What was far more serious was the very unexpected arrival of the U.S. Air Force, which quickly gained command of the air and decimated the Northern Air Force.

Speedy action by the United Nations put forces in South Korea that, under the overall command of the U.S. Commander quickly pushed the North Koreans back towards the Chinese border. This was not the Communist plan at all and units of the Chinese army and the Soviet Air Force were sent to help out their Korean allies, who had got themselves in such trouble.

This was the start of the "MiG Alley" battles. The Russians started to use MiG-15's to intercept the formations of B-26's and B-29's. Many were the battles between the MiG-15's and American F-86's (most of the other air forces making up the U.N. contingent doing close support) although there were a few battles between British Gloster "Meteors" and the MiGs.

The MiG-15 was something of a shock over Korea as it showed the West that the Russians were quite able to build modern jet fighters and use them in combat. Not that the MiG was perfect, it lacked sufficient punch, being

undergunned and was not a steady gun platform, while it lacked any form of radar sighting for the few guns that it carried. Most of the pilots flying over Korea were there to gain experience, while many of the U.N. pilots had much combat experience, and this showed in the casualty rate. The Soviet Air Force lost about ten times the number that the U.N. forces lost in combat.

The MiGs did manage a quite high success rate against the American bombers however, and it was probably this success that made the Russians think seriously about their own heavy bomber program. As a result the Tu-85 was not put into production as it would have been too vulnerable, while the Tu-16, the Tu-20 and the Mya-4 were all speeded up.

The war also gave the Russians the opportunity to examine much of the American and British equipment and radar, as there was a fairly constant delivery of these in bent airplanes which littered North Korea. The use of helicopters in rescue operations was probably very instructional too. In short, the Soviet Air Force may have paid quite a lot in aircraft in the Korean war, but it learned a very great deal from the allied air forces, and although the South was not taken over the operation was not an entire loss.

The later half of the fifties saw the Soviet Air Force being re-equipped with much more potent machines than it had had before. The supersonic MiG-19 had gone into service in 1955 and was being built in large numbers, while the Il-28 was also available in quantity. The heavy bombers were coming into service, the Tu-16 in 1954, the Tu-20 about a year later. The Mya-4 came into service in 1956 although it was built in smaller numbers.

All this new equipment made some of the older machines, while quite usable, slightly out of date and many air forces now started to get MiG-15 and 17's and Il-28's as standard machines. All of the Warsaw pact countries had these machines, while many of the Arab states received these types, especially Egypt. During the Suez war of 1956 many MiG-15's were lost to Israeli fighters through being caught on the ground in most cases. The Il-28's were wisely moved out of range of the Israeli fighters until the end of the war.

The last few years of the fifties saw a whole new generation of machines being tested for the Soviet Air Force. Such well known planes as the MiG-21, the Su-7 and 9, the Tu-22 and 28 and later versions of the Yak-25 were all tested about this time. The Soviet Air Force was also in the late fifties building up a considerable sized force of transport aircraft. Il-12 and 14's were in service in large numbers, replacing the old Li-2's (Dakotas or C-47's to you and me) and the An-8 and 12 were on test. The Yak-24 twin rotor helicopter had been built, after months of trouble with vibration on original tests, for the airborne forces and was used in fair numbers, although it was to be replaced by Mi-6's and Mi-10's in many units when these became available.

By 1960, training was being done still by a few of the very old pre-war Polikarpov UT-2's, although most of these had been replaced by Yak-18's of

one type or another. Advanced training was still being done by Yak-11's although the Czech L-29 was soon to come into service. Most advanced training had to be done on modified versions of older machines, in fact it still is.

The Soviet Navy in the fifties had Tu-14 bombers and Be-6 twin-engined flying boats for reconnaissance work and had to rely on these well on into the sixties; although the Tu-14's were replaced by Tu-16's and Il-28's. A number of standard Soviet fighters were used by the Navy also. The Naval Air Force strength in the early sixties was about 4,000 against the approximately 20,000 that the Air Force had; this included planes of all types.

The Supersonic Age

While it is true that Russian planes had achieved supersonic flight quite early in the first service machine to be truly supersonic, it was not until the MiG-21 first flew that the Russians had a machine that was of really advanced supersonic performance. This first appeared in public in 1956, and it was followed into service by the Su-7 and 9, the Tu-22 and the Tu-28 and such advanced types as the Su-11 and the MiG-23, these latter two machines being put into service in the late sixties. The Yak-28 was supersonic but its top speed was only just over the speed of sound and so it really is not very up to date in this respect.

The supersonic age saw the use of Su-7's for close support work and the abandoning of the idea of a specialized design for this work. MiG-21's were built in very large numbers for use both in Russia and by the Warsaw pact countries, all of whom use this light fighter, and of course it is exported to all the countries that come under the Russian sphere of influence.

Rather like the Western countries, Russia has built fewer of the supersonic types than the generation before. Nearly 2,000 Tu-16's were built, but so far it is estimated that the Russian long range bomber force has about 175 Tu-22's. Even so, the numbers being built are impressive.

It is true, as is well known, that Russia does not rely only on her supersonic bombers, and that she has a large number of missiles. The estimates in 1971 are that she has about 1,250 ICBM's and about 700 IRBM's, but all the missiles are directed by a special Missile Force formed in 1960 under a Marshal M. I. Nedelin (who was accidentally killed shortly afterwards). The chief of the Missile Force ranks as a marshal, and the force is quite independent of the Air Force.

The Supersonic Age has seen the Soviet Air Force become a modern, well equipped force, with some of the best aircraft in the world. Its allies in the Warsaw pact countries are also well equipped with Russian built, or at least Russian designed, planes and equipment, and there is an increasing number of small air forces that rely upon Russia for their airplanes.

The transport section of the Soviet Air Force would, in an emergency, be able to draw upon the aircraft operated by Aeroflot, in many cases they

operate the same aircraft. In some cases Aeroflot gets an aircraft before the Air Force. In the case of the giant An-22 Aeroflot got several before the Air Force, but both organizations use this huge machine, although in small numbers.

In 1971 then, the Russian Air Force is estimated to have the following front line aircraft: Bombers (long range) 900, about 550 Tu-16's, 175 Tu-22's, 100 Tu-20's and about 100 Mya-4's. The Tactical Support Command has about 4,000 aircraft made up of Yak-28 light bombers, Su-7's, some MiG-21's and Yak-28P fighters. The fighter force has about 3,300 aircraft, mostly MiG-19's and MiG-21's with also many Su-9's.

The MiG-23, the Su-11 and the Tu-28 are in service in increasing numbers, although it seems reasonable to suppose that the Tu-28 will be built by the hundred, rather than thousands. The transport units of the Air Force have about 1,800 aircraft, mainly Il-14's, Il-18's, An-12's and An-24's with a small number of An-22's. All commands will have a collection of odd aircraft for communications and training work such as the An-2, the Yak-12 and the An-14, and probably some of the smaller helicopters, such as the Mi-1 or 4 or perhaps one of the Kamov types, such as the Ka-15 or 25K.

During the first half of 1971, while this book was being prepared, one or two new machines became known to the West, either because they were displayed at the Paris Air Show or through other means.

A new version of the MiG-21 was identified, and called "Fishbed-J" by NATO. The most obvious differences between this machine and previous MiG-21's is that the fairing behind the cockpit canopy now runs dead straight from the rear edge of the canopy to the fin. There are now two mountings for stores under each wing. An anti-submarine version of the Il-18 has also been identified, this being christened "May" by NATO. This has a radar installation in the nose and the usual MAD installation in the tail.

At the 1971 Paris Show the Russians showed two new machines. The first was a new military transport plane which looks very much like the Lockheed C-141A Starlifter. This craft first flew on March 25th of this year, so it really is a new arrival. This machine was designed by the Ilyushin team under G. V. Novozilov, who has taken over the leadership of the bureau. The Il-76 is powered by four Soloviev D-30KP turbofan engines each giving 26,500 lbs thrust. The dimensions are reported as being: wing span 152 ft 10 ins, length 152 ft 10 ins and the maximum take-off weight 346,000 lbs. Maximum payload is about 88,000 lbs. The maximum cruising speed is reported at 530 m.p.h. and the normal maximum range is given as 3,100 miles. The Il-76 employs a mechanized handling system to stow the large loads that it can carry and also it has various high-lift devices so that it can operate from small airfields. The Ilyushin bureau are also reported to be developing an air-bus type of plane called the Il-86, but this is not expected to be ready for several years yet, probably not until 1976.

The other new machine was the Mil-V-12 (or Mi-12). This gigantic machine

is the world's biggest helicopter, being almost twice the size of its next rival, the Mi-6. The V-12 is basically two of the Mi-6 rotors and power units placed one either side of a huge new fuselage, the rotors and motors being hung on a system of struts. The normal crew is six, and the cargo hold is over 100 ft long. The maximum take-off weight is given as 231,500 lbs with a payload of 78,000 lbs. The fuselage is 121 ft 4 ins and the maximum width with the rotors turning is 219 ft, all of which makes it quite a helicopter! The V-12 first flew in late 1968 and it is likely to be used by both the Soviet Air Force and Aeroflot. The prototype is painted in Aeroflot colors.

The last new development has not been announced at all, at least not by the Russians. It has been reported in the Aviation press that one of the U.S. reconnaissance satellites has sent back photos of a new Russian bomber. The new machine is roughly about the size of the Tu-22 and has variable sweep wings. No further information is so far available, but the design of the Tu-22 is such that it would not be impossible to produce a much more swept version with variable sweep wings. The center section of the wings could remain without disturbing the undercarriage, which has a good wide track. This way it might be possible to produce a machine with a high performance at fairly low cost. Time will tell.

PART II: Three-views Aircraft/Specs/Performance



An early type Antonov An-2 with Hungarian civil markings.

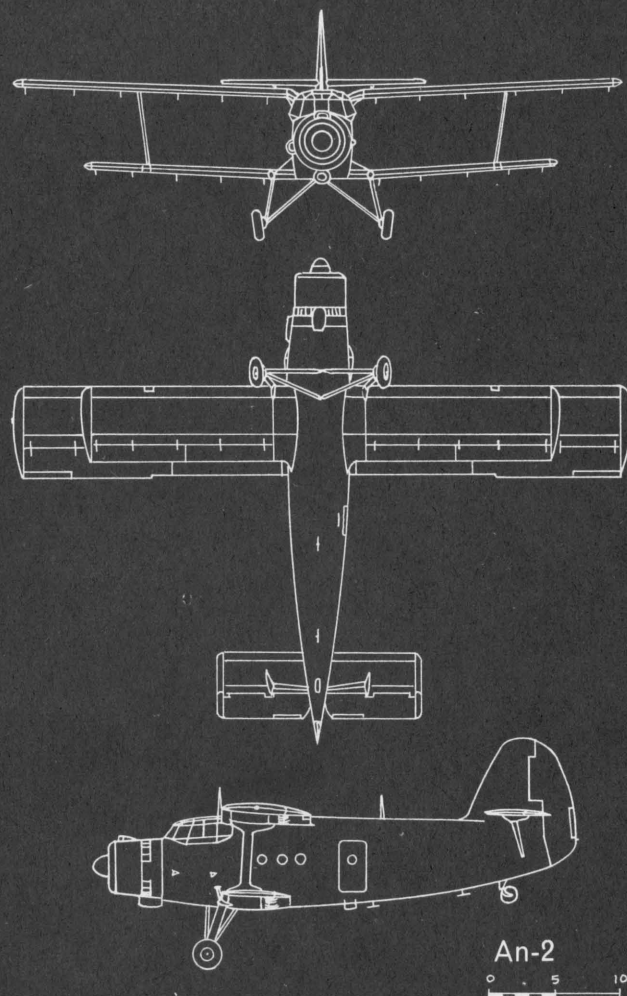
Antonov An-2 "Colt"

Every air force needs a reliable utility plane and the Soviet Air Force uses the An-2 in very large numbers, as do all the Eastern bloc air forces.

The An-2 was originally designed for the Ministry of Agriculture and Forestry, and the prototype first flew in 1947. Since then at least 5,000 have been built in Russia and many have also been built in East Germany, Poland, and China. In 1964 the An-2M was produced with a redesigned tail unit, the fin and rudder being much more angular than previous versions. There is also a seaplane version developed in 1954 called the An-2V, but this is also referred to as the An-4.

The fuselage is all-metal but the wings are metal framed and covered with fabric aft of the front spar, as are the tail surfaces. The engine is the Shvetsov ASh-62IR, which drives a four-blade propeller and gives 1,000 h.p. The An-2 normally carries a crew of two and up to 14 passengers; or it can carry about a ton and a half of freight. The Soviet Air Force uses the An-2 for transport, navigation, parachute training and ambulance duties. The Russian air line Aeroflot uses it for transport, crop dusting, water bombing, and meteorological research as well as arctic exploration, and so the An-2 must be considered one of the important airplanes built since WW-II on account of its versatility.

*Data: Wing span 59 ft 8 ins. Length 40 ft 8 ins. Height 13 ft 9 ins.
Wing area 769.8 sq. ft. Empty wt. 7,495 lbs. Max. take-off wt. 12,125 lbs.
Max. speed 157 m.p.h. at 5,750 ft. Economic cruis. speed 115 m.p.h.
Range 560 miles. Ceiling 14,250 ft.*





A standard Antonov An-12 in the markings of the Soviet Air Force.

Antonov An-12 "Cub"

The An-12 is the standard heavy transport plane of the Soviet Air Forces and it is likely to be in service for some years to come.

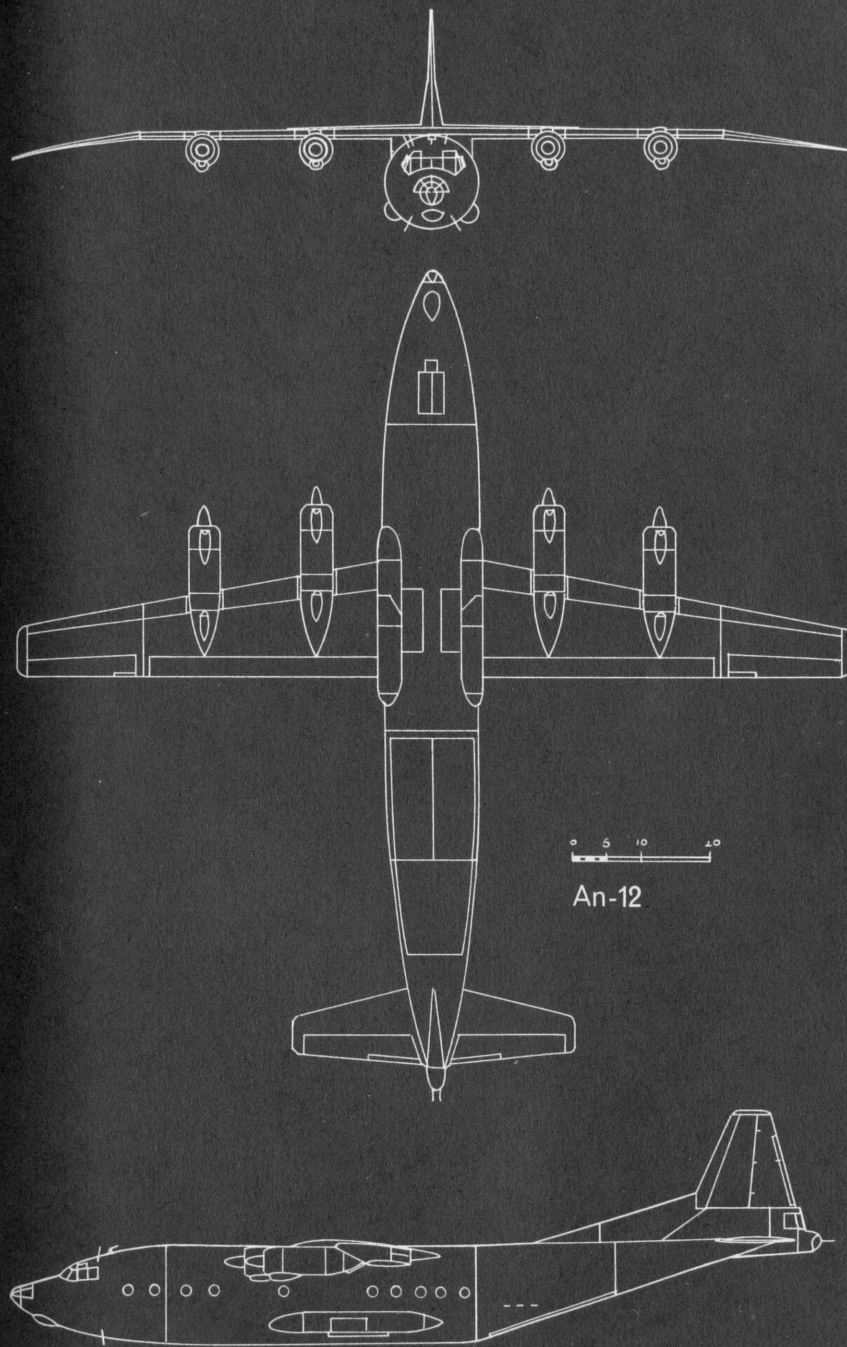
The An-12 is a redesign for military purposes of the An-10 which was designed for Aeroflot. This in turn was developed from the An-8, a twin-engined military transport built in the late fifties, but not in large numbers. The chief differences between the An-10 and the An-12 are that the An-12 has a rear loading ramp and doors built into the rear fuselage, which is swept up to accommodate this. It also has a rear gun position equipped with twin 23mm cannon. There is a built-in freight handling system that can deal with loads up to two and a half tons. Fully loaded trucks can be carried. There are several hundred An-12s in service with the Soviet Air Force as well as those supplied to Algeria and India, some to Indonesia, and many to Eastern Europe and the Arab countries.

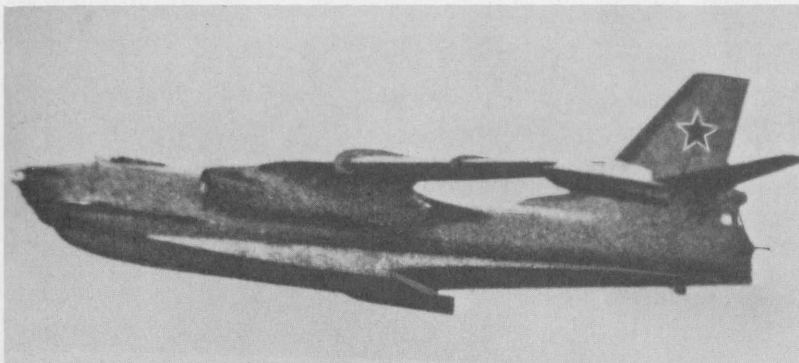
The An-12 is also the standard transport airplane for the Red Army airborne forces, being used to carry up to 100 parachute troops at a time or up to 130 ordinary soldiers. Quite large loads can also be carried for dropping by parachute in the usual manner.

The An-12 is an all-metal airplane, with marked anhedral on the outer panels of the wings, upswept rear fuselage, and four Ivchenko AI-20K turbo-prop units driving four-blade 14 ft 9 ins diameter propellers and giving 4,015 h.p. each.

The An-12 can be fitted with skis for Arctic operations.

Data: Wing span 124 ft 8 ins. Length 108 ft 3 ins. Height 34 ft 6 ins. Wing area 1,310 sq. ft. Max. payload 44,000 lbs. Max. take-off wt. 134,000 lbs. Max. cruise speed 373 m.p.h. Normal cruise speed 343 m.p.h. at 25,000 ft. Range approx. 2,100 miles. Ceiling 33,500 ft.





One of the few photographs of the Beriev Be-10, still in service in some numbers.

Beriev Be-10 "Mallow"

Although the Be-10 first appeared at the Aviation Day fly-past at Tushino, Moscow in 1961, not very much is known about this interesting flying boat. It was later identified as the Be-10 and it is known that small numbers are in service with Soviet Naval Aviation, the A.V.-N.F. In 1961 several records were claimed which must have referred to the Be-12 and the estimates for the aircraft's performance are based on these.

It is difficult to see where any form of stores could be carried except under the wing, and here they would get very wet during take-off; they could even get damaged, and this could limit the usefulness of the machine. Possibly, this is why not very many were built. It could be, however, that the Russians find it cheaper to use the Be-10, using sonar equipment while on the surface of the water, rather than have aircraft dropping sonar buoys as do the NATO forces. This could well extend the life of the Be-10 longer than would normally have been its useful life. There is a possibility that Aeroflot may have tried using the Be-10, although the loading problems would seem to limit its usefulness to them also.

The Be-10 has a crew of five, and carries four cannon, two fixed firing forward, and two in the tail-gun position. These are almost certainly 23 mm guns.

The engines are AL-7RV jet units, probably designed by Lyulka, giving 14,330 lbs thrust.

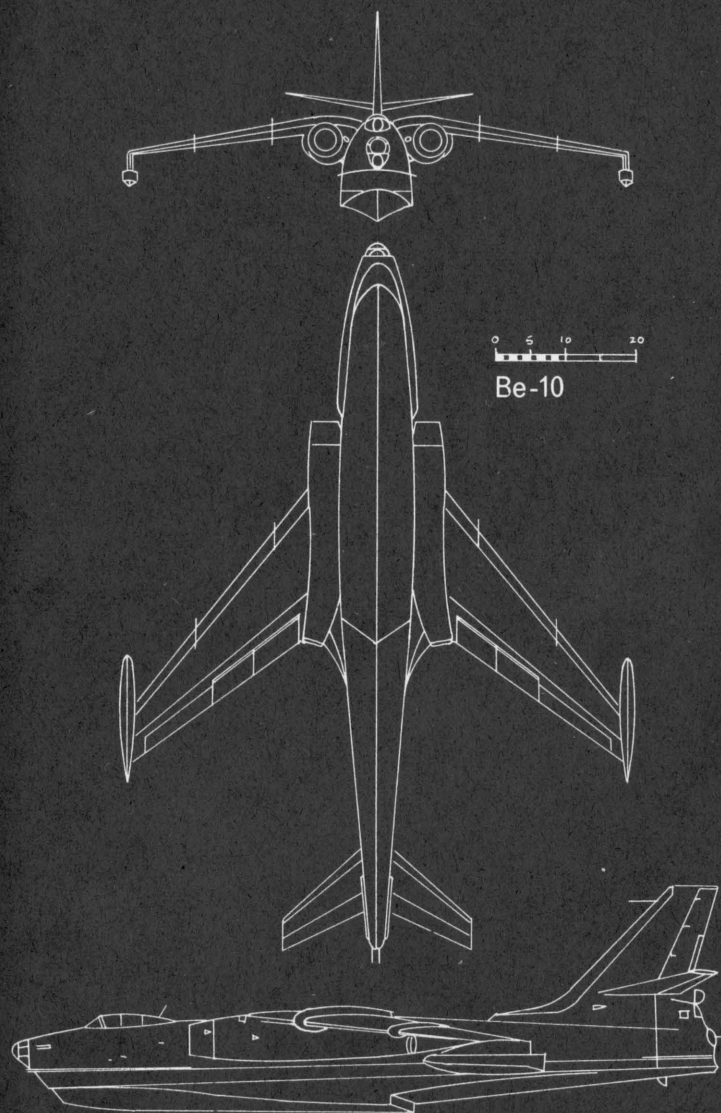
Data: Wing span 73 ft. Length 109 ft.

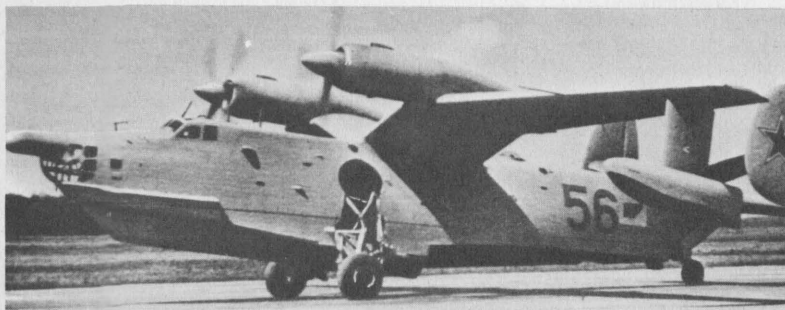
Wing area 1,200 sq. ft. Max. take-off wt. 90,000 lbs.

Max. speed 567 m.p.h.

Range 1,400 miles. Ceiling 49,100 ft.

All the above are estimated figures.





The Beriev Be-12 amphibian showing details of the undercarriage.

Beriev Be-12 "Mail"

Although the Be-12 appeared at Tushino in 1961 nothing further was heard of it until several records were claimed in October 1964 for a flying boat which would fit the description of the Be-12. Later in 1967, at the now famous air show at Domodedovo, the Be-12 was seen to be in service in numbers as a formation of three demonstrated for the A.V.-N.F.

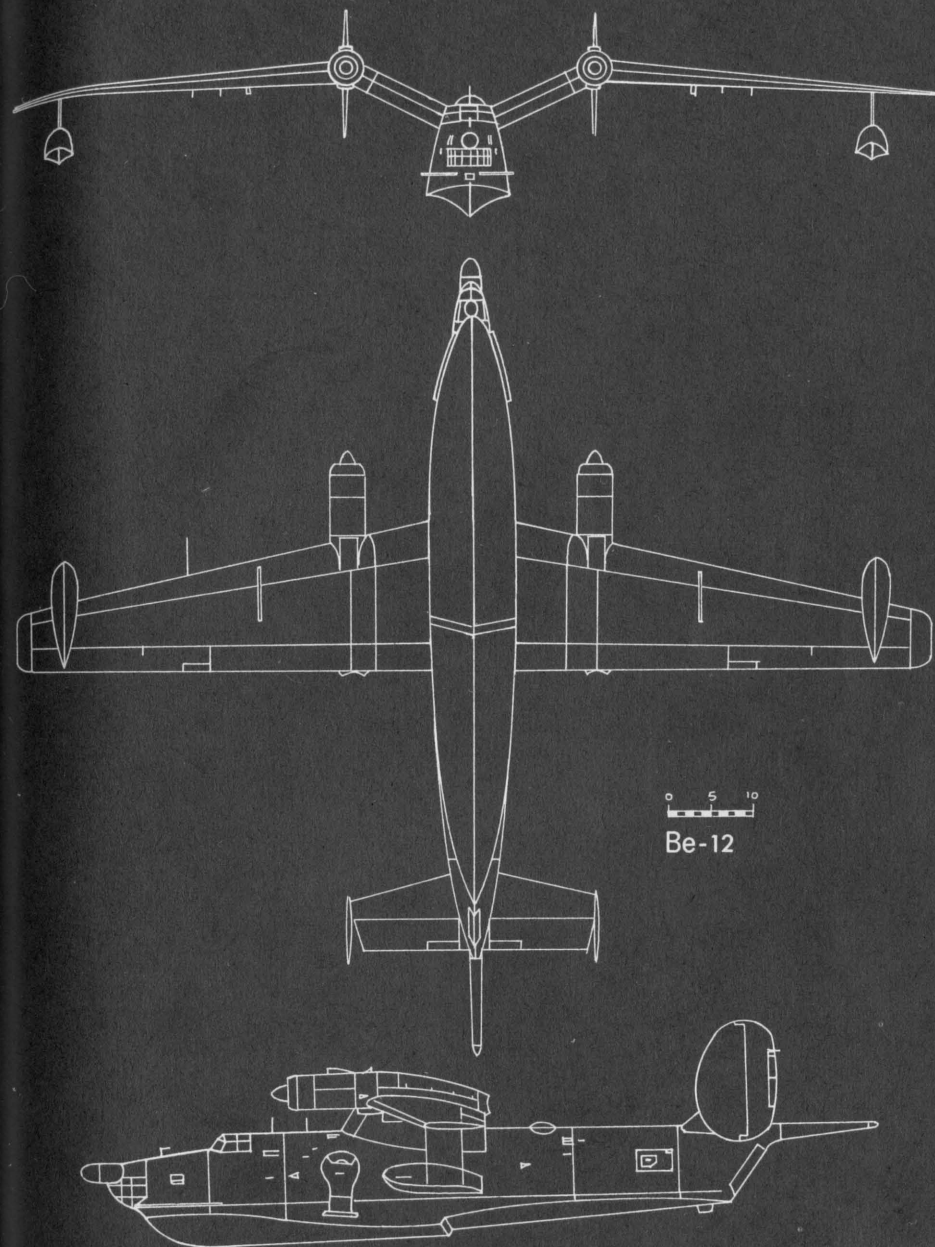
The Be-12 is a natural development from the earlier Be-6 which also served in numbers for many years, but the Be-12 is a completely new design; it is not just a re-engined, hopped-up version of the earlier machine. The search equipment on the Be-12 is far more comprehensive, with normal search radar in the nose and an extension behind the tail carrying a magnetic anomaly detection device. There are mountings for stores to be carried under each wing. The Be-12 is an all-metal machine and is the largest amphibian in service. The undercarriage is fully retractable. The engines are Ivchenko AI-20D turbo-prop units driving four-blade propellers and giving 4,190 h.p. The normal crew is six. In Russia the Be-12 is called "Tchaika" (Gull).

Data: Wing span 108 ft. Length 96 ft. Height 23 ft.

Max. take-off wt. 65,000 lbs.

Max. speed 380 m.p.h. approx. Cruis. speed 240 at 5,000 ft approx.

Range 2,500 miles. Ceiling 37,000 ft.





A picture of an Aeroflot Il-14 showing the kind of conditions that Soviet aircraft have to operate under.

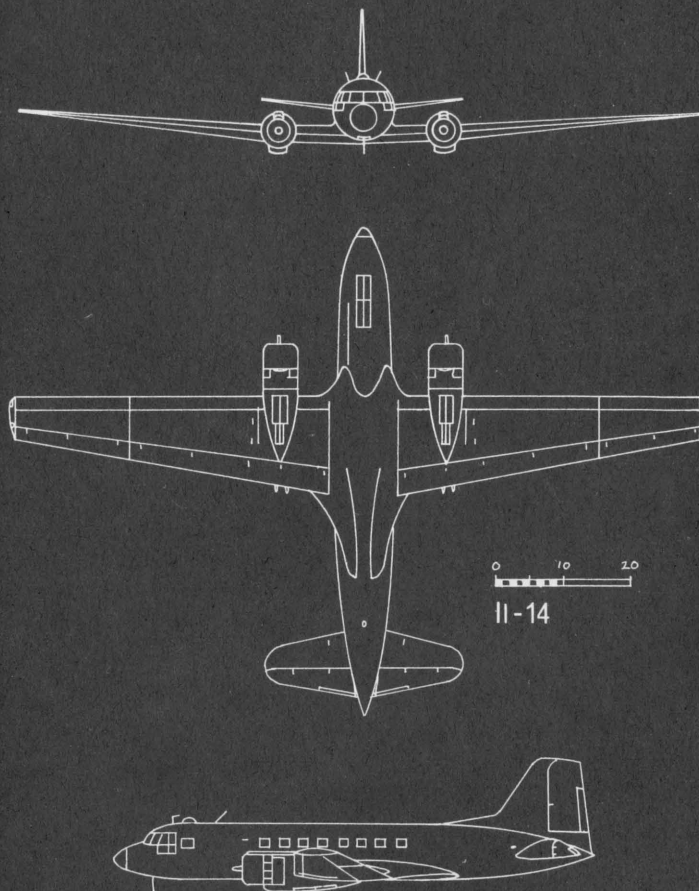
Ilyushin Il-14 "Crate"

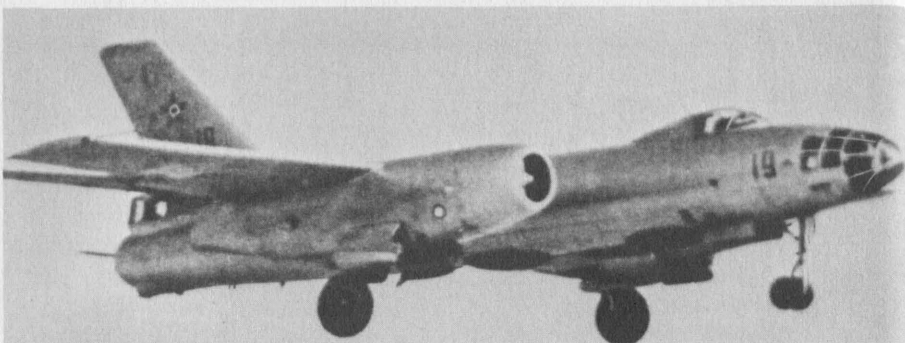
Just after the war most countries realized that air transport had come to stay and designers all over the world were given the task of producing a DC-3 replacement. Most of these replacements did not in fact succeed, but one which was built in almost as large numbers was the Russian design from the Ilyushin team, which was the Il-12. This was a conventional twin-engined low wing monoplane with a tricycle undercarriage, the engines being Shvetsov ASh-82FNV of 1,775 h.p. each. The Il-12 normally had a crew of five and carried up to a maximum load of 32 passengers. The Il-12 was in production for several years and was a considerable success with "Aeroflot" and other Eastern Bloc countries' air lines.

It was also used by the Soviet and other air forces as a transport and for parachute operations.

In 1954 an improved model started coming off the production lines, fitted with more powerful engines, the ASh-82T which gives 1,900 h.p.; and redesigned wings and tail surfaces with square tips instead of the round tips on the earlier machine. The fuselage is also longer in some versions. These alterations have improved the performance slightly, and have allowed a few more passengers to be carried on the longer fuselage version, the maximum now being 42. The Il-14 is also built in East Germany and Czechoslovakia, where it is called the Avia 14. The Il-14 is used in hundreds by "Aeroflot" and the Soviet Air Forces and all the air forces that use Russian equipment. It is a sound, competent but unexciting design that will be used round the world for many years yet.

Data: (Il-14M) Wing span 104 ft. Length 73 ft 2 ins. Height 25 ft 11 ins. Wing area 1,075 sq. ft. Max. take-off wt. 38,500 lbs. Max. speed 259 m.p.h. Economic cruise 193 m.p.h. at 9,850 ft. Max. payload range 810 miles. Ceiling 22,000 ft.





An Ilyushin Il-28 light bomber of the Rumanian Air Force; note that this machine has a second radome under the fuselage.

Ilyushin Il-28 "Beagle"

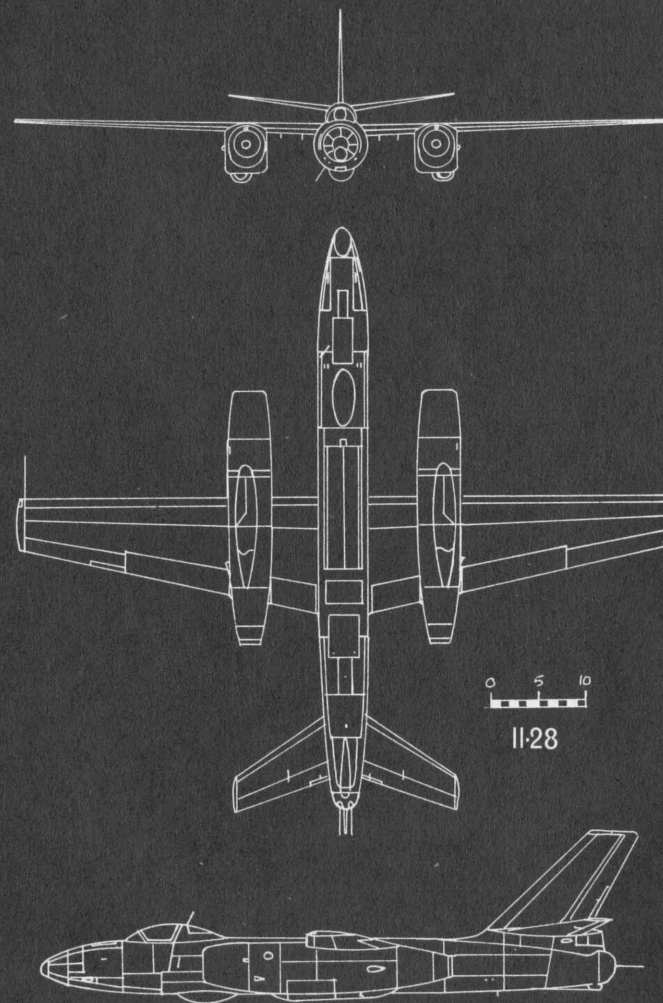
The Il-28 was designed as a light tactical bomber to replace the Tu-2 just after the war. The prototypes were almost certainly fitted with some of the Rolls-Royce "Nene"s that Britain sold the Russians and which were available at the time. The Il-28 was a very straightforward design although the combination of a straight wing and swept tail surfaces is unusual in an plane of this size.

The Il-28 has been built in very large numbers, equipping all the Eastern Bloc countries air forces, as well as those of the Arab states, China, and Indonesia. In 1962, the Il-28 made history by very nearly equipping the air force of Cuba, a few machines actually being based on the island for about two months. It seems that Castro was not very impressed with them, but there is no doubt that they would have constituted quite a threat.

Il-28's are still in service in fair numbers, about 800 having been exported outside the Soviet Union. There are not many different versions, although there is an advanced trainer variant, used by some of the communist countries. For a short time, "Aeroflot" used a few in 1956 to get used to jet operations before introducing the Tu-104. These craft were called Il-20 although they were only demilitarized Il-28's. The crew is normally three, and the engines are Klimov VK-I's giving 5,950 lbs thrust. These engines are improved "Nene"s.

Nowadays, the Il-28 is obsolete but it is still in service in numbers and could be a tactical threat for a while yet. The normal bomb load is about three tons, while the standard armament is three 23 mm cannon, one firing forward and two in the tail. Long range tanks can be fitted to the wing tips.

*Data: Wing span 70 ft 4 ins. Length 57 ft 11 ins. Height 22 ft.
Wing area 654,4 sq. ft. Wt. empty 31,000 lbs approx. Max. take-off wt. 46,300 lbs.
Max. speed 559 m.p.h. at 14,700 ft.
Range 1,250 miles. Ceiling 40,300 ft.*





The prototype Il-76 in Aeroflot markings at the Paris Show, 1971. The Air Force version is likely to be more or less similar. (Flight International Photo).

Ilyushin Il-76

Recently, the Russians have been sending some of their latest civil aircraft to the Paris Aero Show, and their displays have been of increasing interest. The Russian exhibits at the 1971 Paris Show were, however, of greater interest than usual because not only was the Tu-144 SST there, but so was the mighty V-12 helicopter and the very new Il-76. So new was the Il-76 in fact, that after the show it was disclosed that it only made its first flight on March 25, about three months previous to the show.

The Il-76 is very similar in layout to the Lockheed C-141A although this is becoming something of a standard layout for heavy military transports, so we should not think in terms of one group copying another's work. It's just that this is the layout for the job. In the case of the Il-76, the tailplane had to be fitted at the top of the fin to get it clear of the wake of the wing when the nose is up and all the flaps, slots, and things are working. Generally speaking, the prototype of the new Ilyushin, designed, by the way, by G. V. Novozhilov who has taken over the group design team upon the retirement of Ilyushin, is slightly bigger, slightly heavier, and more powerful than the C-141A, although what will have happened to it by the time it gets into production in a few years time is anyone's guess.

Although the machine at Paris was in Aeroflot colors it is understood that the Il-76 is intended for the Air Force heavy transport units. The engines are Soloviev D-30KP turbofans giving 26,500 lbs thrust and the Il-76 is one of the very few Russian machines designed with the engines mounted on pylons, the only others being the Il-54 light jet bomber prototype, and the Mya-52 delta wing jet bomber.

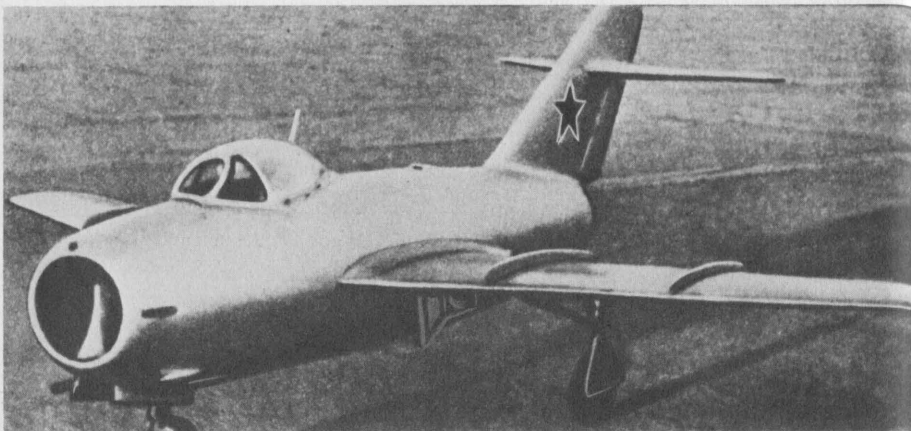
Data: Wing span 168 ft 8 ins. Length 152 ft 10 ins. Height 48 ft 6 ins.

Max. take-off wt. 346,100 lbs. Max payload 88,200 lbs.

Max. cruis. speed 528 m.p.h.

Max. range 3,100 miles.





This is almost certainly one of the prototypes of the MiG-15.

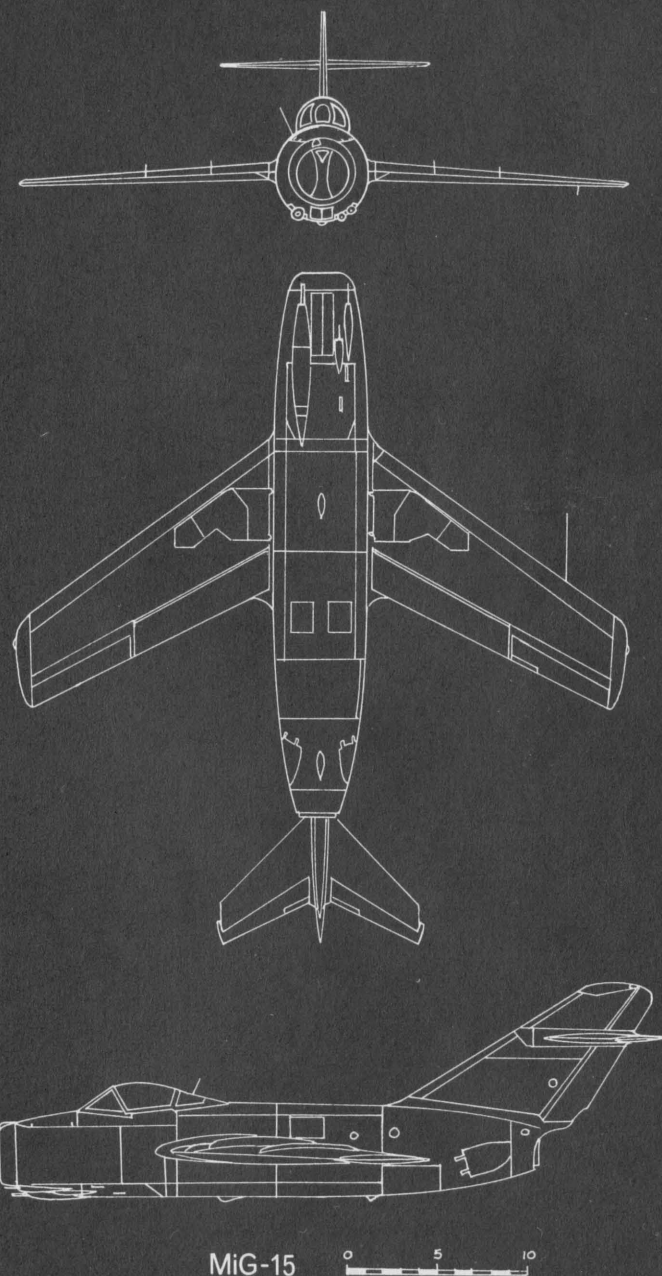
Mikoyan MiG-15 "Fagot"

Originally designed in 1946, to be powered by a development of the German Jumo 004 turbojet which had been captured in large numbers and built in large numbers as the RD-10, the MiG-15 was hurriedly redesigned to take the Russian version of the Rolls-Royce "Nene" when these became available. The resulting airplane was small, fairly light but also sturdy, and it had a good performance for its day. Within a few years, most of the satellite countries had the MiG-15 as their principle fighter. When it appeared over Korea, it was a nasty shock to find that this Russian fighter was a very fine aircraft, with good climb and high altitude performance, although its armament was rather light. Too many were lost owing to being flown by inexperienced Chinese pilots, whereas many of the allied pilots were very experienced indeed. While the MiG-15 could outperform the P-51's and F-80's with ease, being a later design, it also came as a surprise to find that it could outperform the F-86 at high altitude, although the F-86 could out-gun the Russian machine. The F-86 was very much better equipped in most respects.

The MiG-15 was in service for many years, in fact it is by no means extinct even today, and it gave the Eastern Bloc countries their first modern jet fighter; it also made the West realize that Russia was quite able to build first-rate modern aircraft. The engine was a Klimov VK-1, giving 6,000 lbs thrust. Armament was usually one 37 mm cannon and two 23 mm guns.

*Data: Wing span 33 ft 1 in. Length 36 ft 3½ in. Height 11 ft 1 in.
Wing area 185 sq. ft. Empty wt. 8,320 lbs. Normal loaded wt. 11,286 lbs.
Max. speed at sea level 668 m.p.h.
Range 560 miles. Ceiling 51,000 ft.*

Note: The MiG-15bis was fitted with a VK-2 engine giving about 6,750 lbs thrust, and this increased the max. speed by about 20 m.p.h.



MiG-15



A MiG-17PF of the East German Air Force; note the radar installation in the nose and the 88-gallon external tanks.

Miloyan MiG-17 "Fresco"

The MiG-17 was a redesign of the MiG-15, the intention being to eliminate the faults that had shown up in combat over Korea. The MiG-17 first came into service in 1953, and as it was built in very large numbers in Russia, China, Poland, and Czechoslovakia, there are many of these aircraft still flying. Nowadays, it is still used but only in the close support role, although it also serves as an advanced trainer in some air forces, its performance being too low for a more active part in operations except in such events as the Nigeria/Biafran War.

Most of the alterations were designed to improve the performance at altitude of the MiG-15, and to make the machine a more docile and steady airplane in which to fly and fight. In Poland, a special ground support version was built with a deeper and wider chord centersection to the wings, which accommodates the twin-wheel undercarriage units needed for rough airfield operations. This version was called the LIM-5.

The normal armament is three 23 mm cannon, although extra guns can be carried instead of long range tanks under each wing, as they were on the MiG-15. A simple form of radar is usually carried in the nose. The MiG-17's that remain in Russian service have the cannon removed and carry four beam-riding missiles under the wings. This version is called the MiG-17PF.

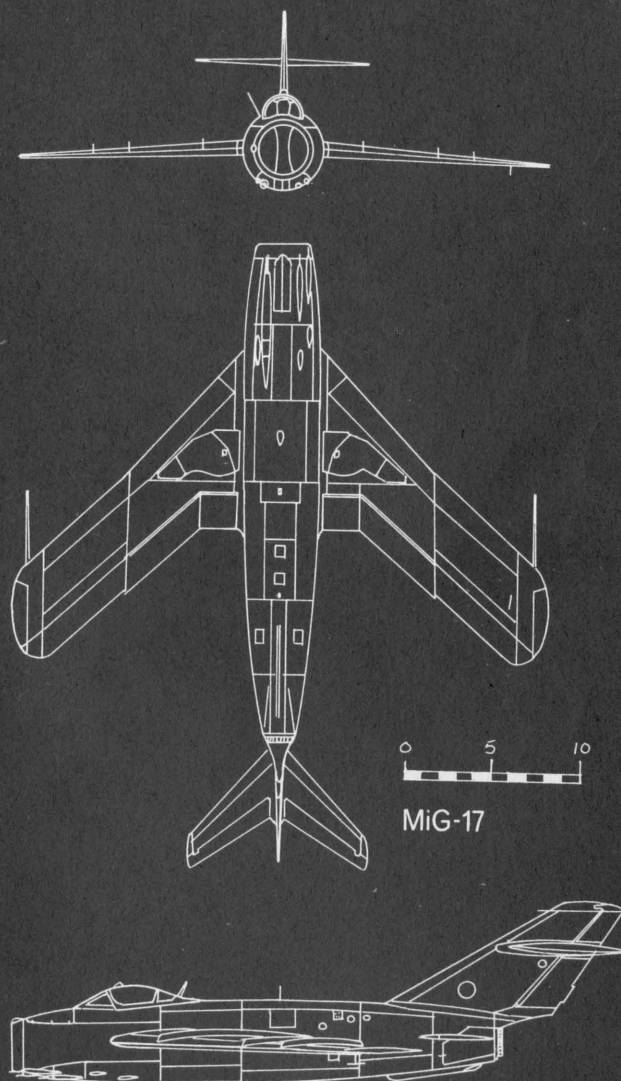
The standard engine is the VK-1A turbo-jet unit which gives 6,990 lbs thrust with the reheat on.

Data: Wing span 31 ft. Length 36 ft 3 ins. Height 11 ft.

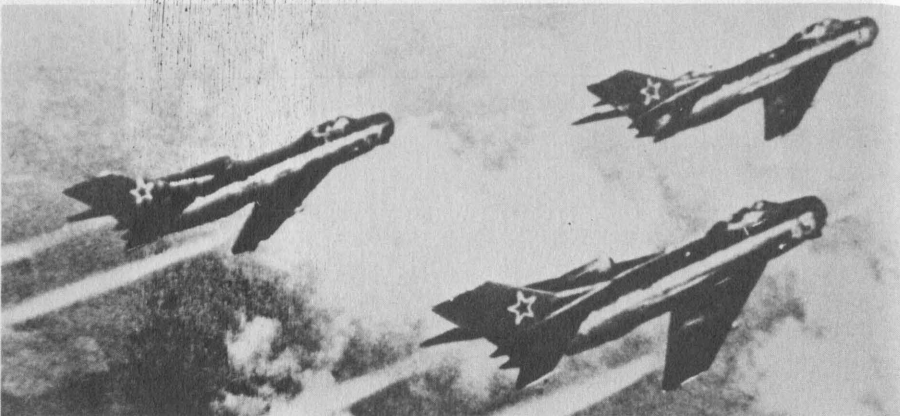
Wing area 223 sq. ft. Max. take-off wt. 14,750 lbs.

Max. speed 645 m.p.h. at 50,000 ft.

Range 540 miles approx. Ceiling 57,000 ft.



MiG-17



A Soviet Air Force aerobatic team at practice. A formation of MiG-19's trailing smoke.

Mikoyan MiG-19 "Farmer"

For about ten years after its introduction into service in 1955, the MiG-19 was one of the world's important airplanes. This was because, not only was it Russia's first supersonic service fighter, but it was built in very large numbers in Poland, Czechoslovakia, and Russia. Many were exported to China before Russia and China became almost-enemies, and it seems likely that there are many still in service in China as well as the Eastern Bloc countries, where they are regarded as second-line fighters.

The design is a logical development from the previous fighters from the Mikoyan-Gurevich design team, with two axial flow jet units instead of the centrifugal jets of the earlier designs. Two units were fitted because at the time there was not a single unit of sufficient power for the new fighter. The guns had to be installed in the wings because the blast, when they were fired, might have affected the axial-flow engines if the guns had been left under the nose as on the MiG-15 and MiG-17. Later versions carried four beam-riding missiles instead of the 30 mm cannon. There is also a night fighter version which is about two feet longer but it is not likely to have been built in very large numbers, the Yak-28 being a very much better proposition.

The engines are Klimov VK-5 units which give a max thrust of 8,810 lbs with the afterburner going.

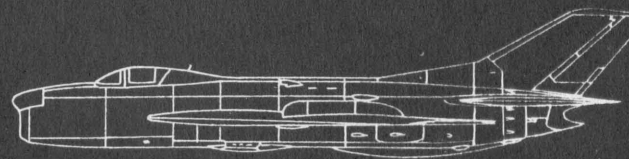
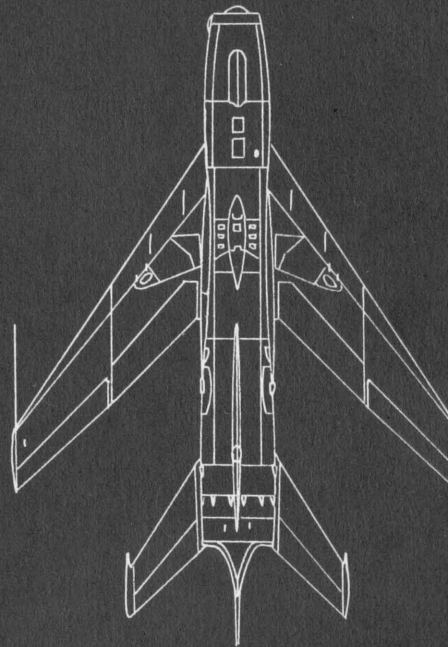
The MiG-19 was used by Pakistan, Cuba, Iraq, Indonesia, and the usual Warsaw Pact countries as well as most of the Arab air forces, although any still in service are likely to be used in either a secondary role or for advanced training.

Data: Wing span 32 ft. Length 37 ft 6 ins. Wing area 285 sq. ft.

Max. take-off wt. 19,850 lbs.

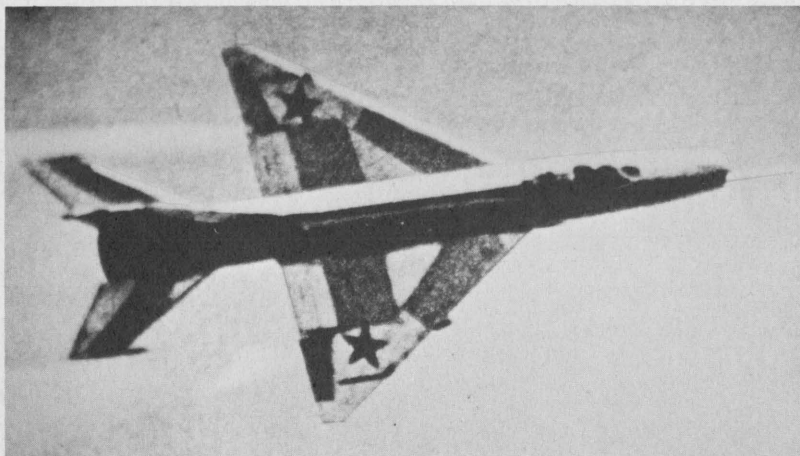
Max. speed 860 m.p.h. at 36,000 ft.

Range 750 miles. Ceiling 55,000 ft.



MiG-19





An early MiG-21F at an air display.

Mikoyan MiG-21 "Fishbed"

The MiG-21 was first seen by western observers at the Aviation Day display at Tushino in 1956, when a prototype was shown. Since then this short range, fairly small, light supersonic fighter has been built in large numbers in Russia, Czechoslovakia, and India. It equips the fighter squadrons of all the Eastern Bloc countries as well as Cuba, Egypt, Finland, India, Indonesia, Iraq, Syria, North Vietnam, and Yugoslavia. There is a two-seat trainer version as well as an experimental STOL prototype, and a MiG-21 was modified to take a scaled-down version of the SST Tu-144's wing for research purposes.

The MiG-21 is a fairly simple interceptor, intended for short range operations in good weather conditions, and for this sort of work it is ideal, being strong but simple to operate, which is important to small air forces without lavish maintenance facilities. Being clean with quite a powerful jet unit the all-round performance is excellent although it is not, in the seventies, one of the world's fastest fighters. It could be quite a menace to any fighter except the very latest in the West, however, and it is not to be dismissed lightly. The jet unit is a TDR R.37F in the latest version of the plane, the MiG-21PF, and this gives a thrust of about 10,000 lbs, 13,200 lbs with reheat.

Early versions carried two 30 mm cannon under the fuselage, but the "PF" version relies on two "Atoll" missiles, or a pack of 16 55 mm rockets under each wing.

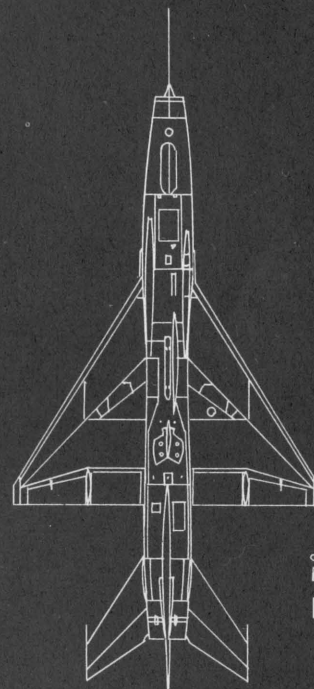
Data: Wing span 25 ft. Length 49 ft. Height 15 ft.

Wing area 250 sq. ft. Max take-off wt. 19,500 lbs.

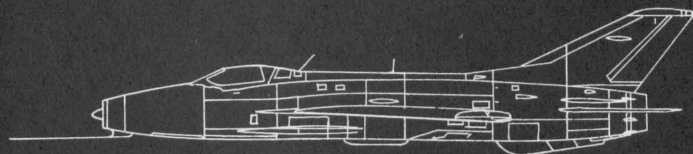
Max. speed 1,450 m.p.h. at 36,000 ft.

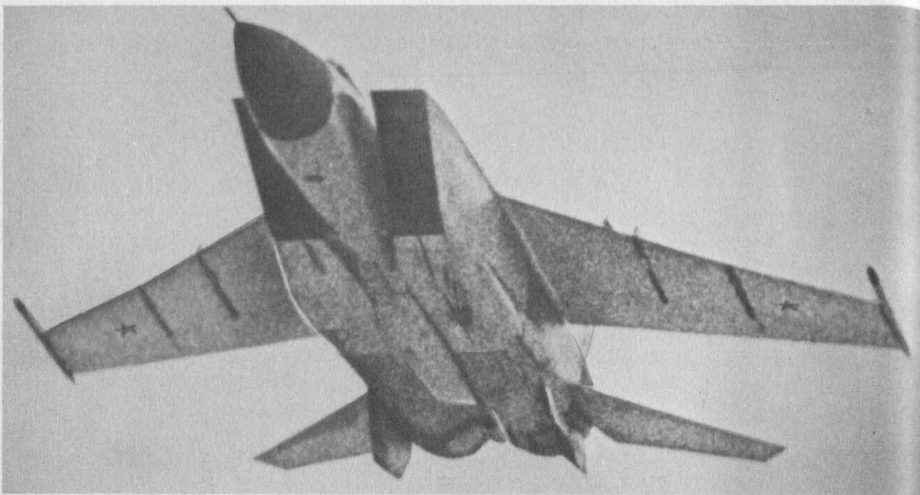
Range 400 miles.

Note: the above figures apply to the PF in a 'clean' state.



MiG-21





The Mach 3 MiG-23 is already in service as an interceptor; it is soon expected to enter service as a strike machine.

Mikoyan MiG-23 "Foxbat"

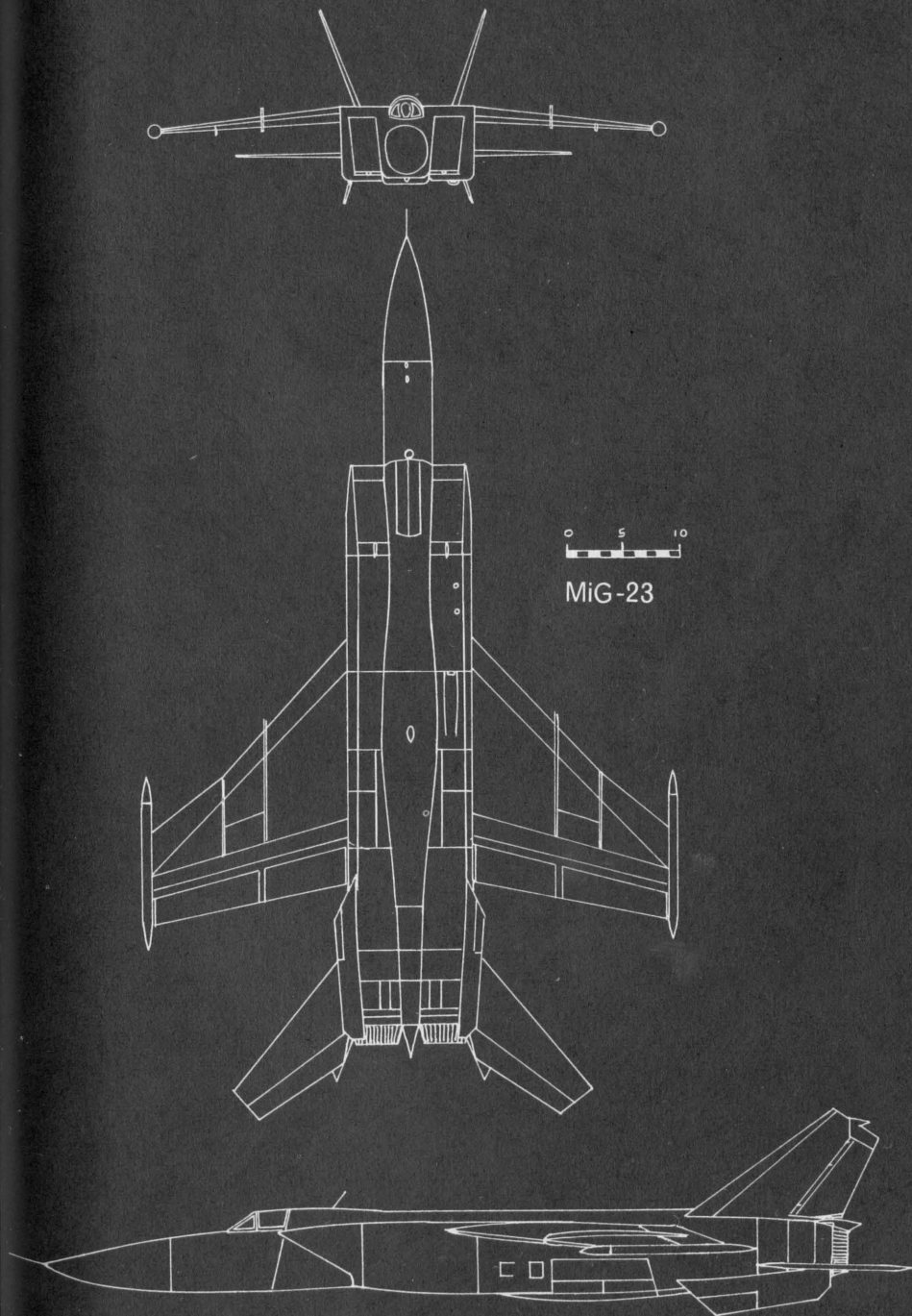
The spectacular MiG-23 was first seen at Domodedovo in 1967, when it caused quite a stir. Nobody could say that the new MiG was good looking, but most supersonic fighters seem to fall down in this respect. One thing is certain, that in this machine the Russians have one of the most potent fighter and strike aircraft in the world today.

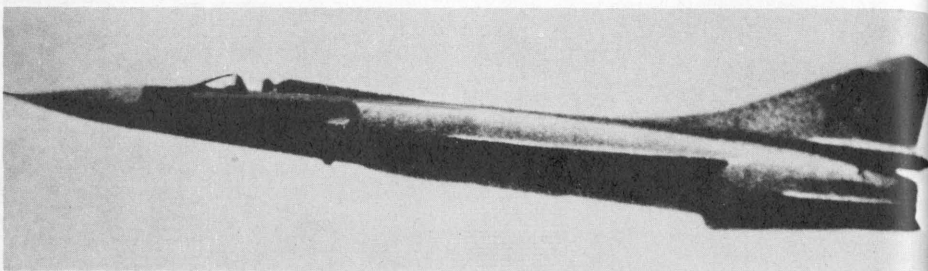
In 1967, a MiG-23, called Ye-266 for record purposes, established several records that give an idea of its abilities. It carried a 4,400 lb payload up to 98,460 ft, and on another day averaged 1,807 m.p.h. over a 1,000 km circuit. Earlier, in 1965, this machine had carried a ton payload 'round a 1,000 km circuit at 1,441 m.p.h. at an altitude of about 70,000 ft.

It must be stressed that the MiG-23 is no prototype, but is in squadron service in its interceptor role and is expected to be in service in the strike role in 1971.

It will be remembered that Russia supplied Egypt with a few of these machines during the spring of 1971, with Russian pilots of course. There is room for a weapons bay between the jet units under the wing, but so far no examples have been seen carrying any outside store at all. It is known that the MiG-23 carries a very advanced communications system as well as the usual radar in the nose. There are also electronic aerials in panels in both top and bottom fins. The engines are rated at 22,000 lbs thrust each, 33,000 lbs with reheat.

*Data: Wing span 47 ft. Length 85 ft. Height 20 ft.
Wing area 830 sq. ft. Max take-off wt. 90,000 lbs.
Max. speed (short dash) 2,100 m.p.h. at about 50,000 ft.*





"Faithless" is an STOL prototype that may by now be entering service as a light STOL fighter.

Mikoyan "Faithless"

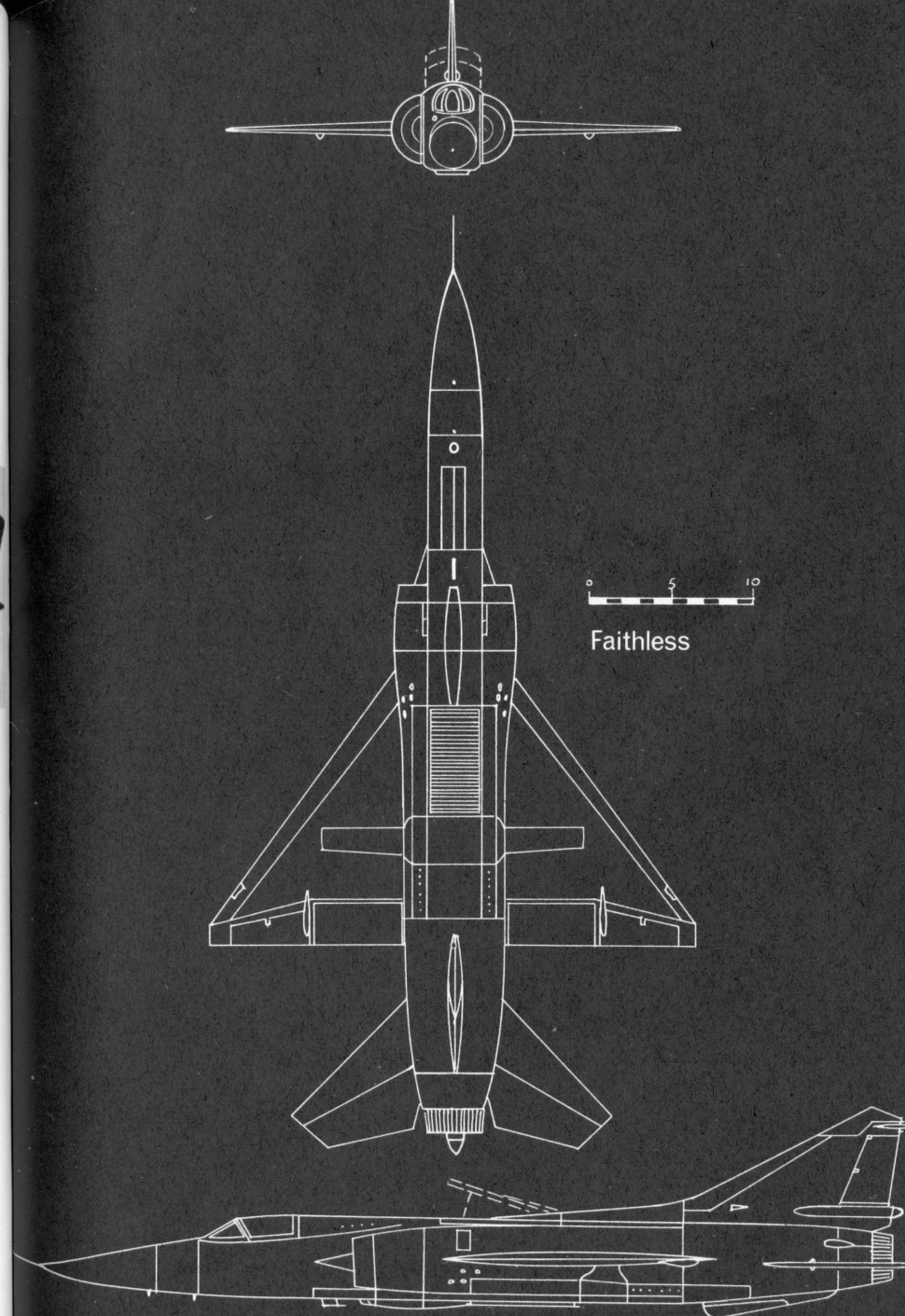
This prototype aircraft was shown at the spectacular air display at Domodedovo in 1967, and is believed to be only an experimental type, although since then it might well have been put into production. It seems likely that it was built to much the same specification as the Sukhoi machine called "Flagon-B", both being STOL machines using two lift engines. The Sukhoi is somewhat larger however and this might suggest the two machines are intended for different purposes. It could well be that the Mikoyan type is intended as an export fighter while the Sukhoi is for home use only.

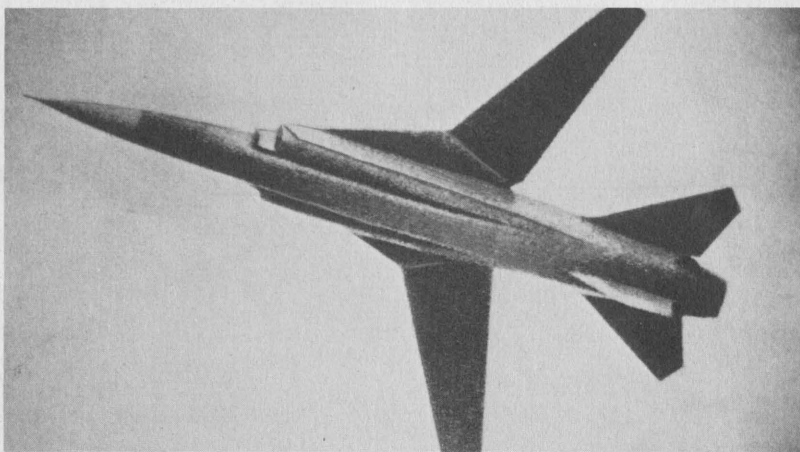
"Faithless" is a small neat delta-wing fighter bomber that could well prove popular with the smaller air forces who would want a STOL airplane with good performance. Radar is carried in the nose in the usual way, and one would assume that stores can be carried under the wings, although the space available is somewhat limited. The power unit is believed to produce about 25,000-30,000 lbs thrust, the power of the lift engines is not known.

Data: (Estimated) Wing span 30 ft. Length 62 ft. Height 15 ft.

Max take-off wt. 45,000 lbs.

Max speed about Mach 2.2-2.4





"Flogger" is a variable sweep prototype, seen here with the wings fully extended. The fuselage is very similar to "Faithless".

Mikoyan "Flogger"

The air display at Domodedovo, in July 1967, produced two variable-geometry aircraft, neither of which had been seen by western observers before. The first machine was obviously an adaptation of a standard Su-7B fighter. The resulting aircraft was announced as being the first variable-geometry machine to fly in Russia, but the impression gained is that this is only a prototype, and will not go into production.

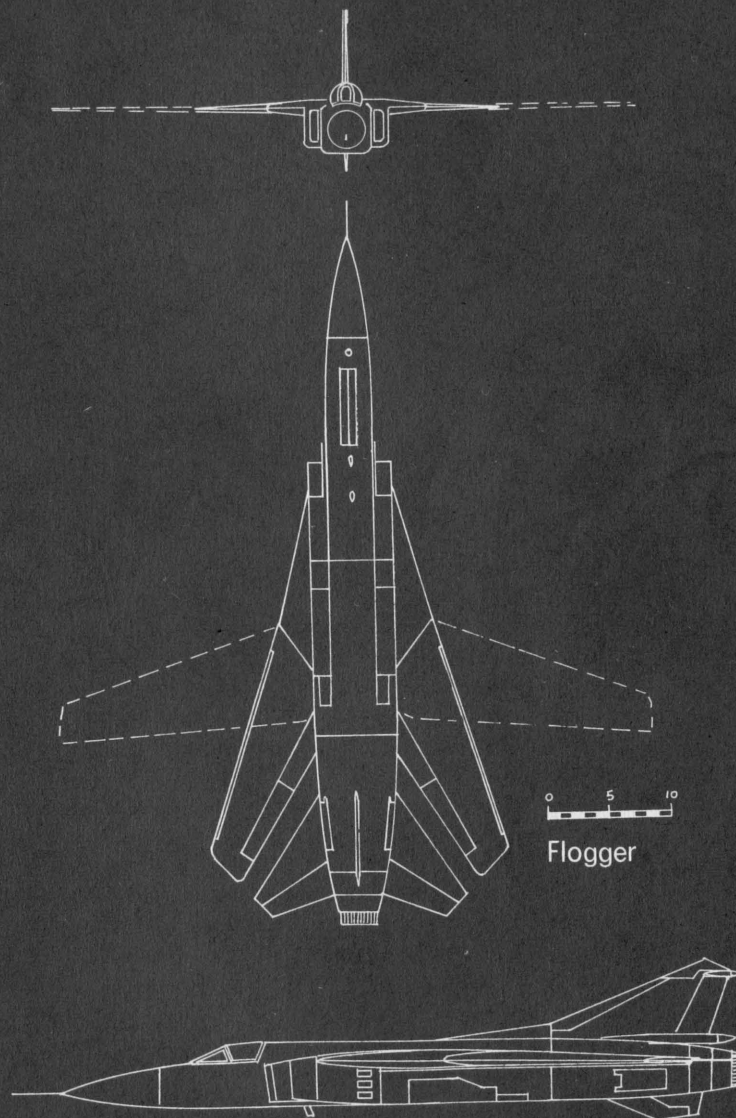
The second machine with variable sweep wings was very different. In general, the fuselage and tail unit are similar to that of the STOL aircraft "Faithless", although the underfin is of a different shape, as are the air intakes for the large jet unit in the tail. The wing is in the shoulder position instead of being in the mid-wing position as in "Faithless", and the general design seems to rather follow U.S. practice as in the F-111, although the "Flogger" is a smaller plane. The wings take about four seconds to travel from fully swept to the low-speed position.

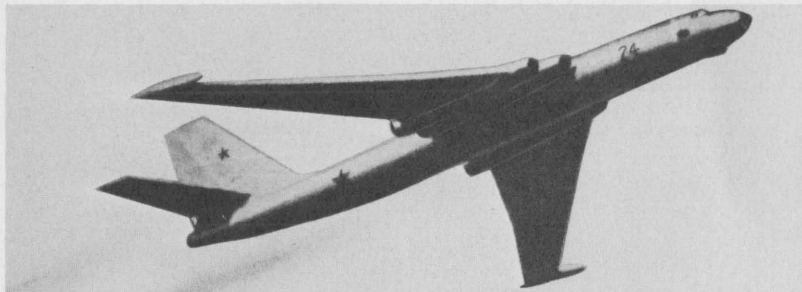
At the time of writing it is not certain that this machine will enter squadron service, but if it does it seems likely that it would start to come out of the factory in numbers sometime in 1971 or 1972, so that it is not likely to be in service until 1972 in any numbers. What may well happen is that a small number may enter service for the look of the thing, but with the Su-11 and the MiG-23 already in service, it really does not seem necessary. The jet engine is rated at about 28,000 lbs thrust.

Data: (Estimated) Wing span (wings swept back) 24 ft. (minimum sweep) 48 ft. Length 60 ft. Height 15 ft.

Max. take-off wt. 45,000 lbs.

Max. speed 1,650 m.p.h. at 40,000 ft.





The Mya-4 bomber has been in service for at least fifteen years, the machine shown here is the standard bomber version.

Myasishchev Mya-4 "Bison"

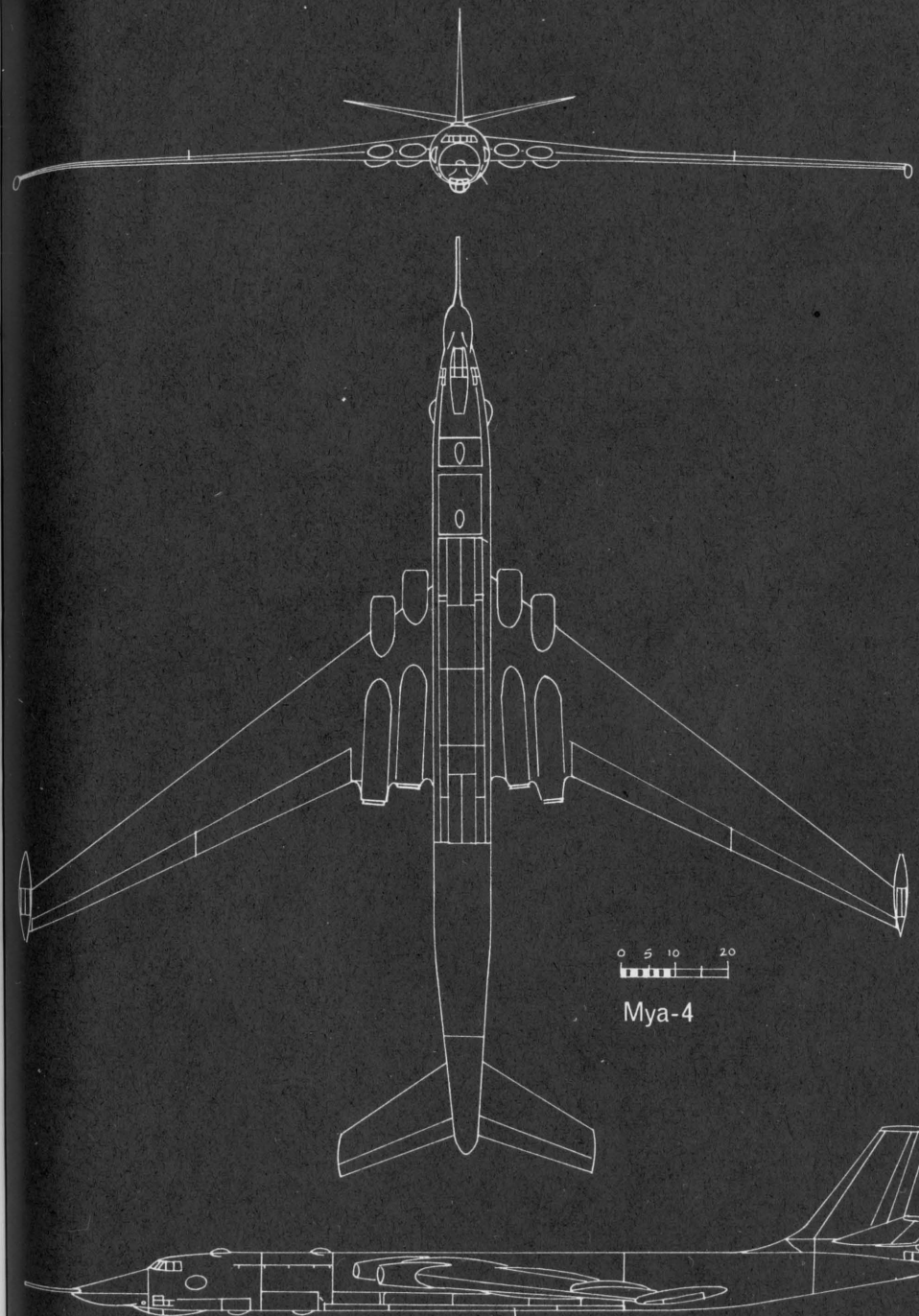
The Mya-4 is quite an impressive airplane which has not had so much attention as some of the other Russian bombers. Possibly this is because the design group responsible under V.M. Myasishchev was not at the time well known; perhaps it is because it has not been involved in many incidents and it also has not been built in very large numbers. The fact remains that the Mya-4, sometimes referred to as the M-4, is a clean, big, jet bomber which shows many design features typical of the period.

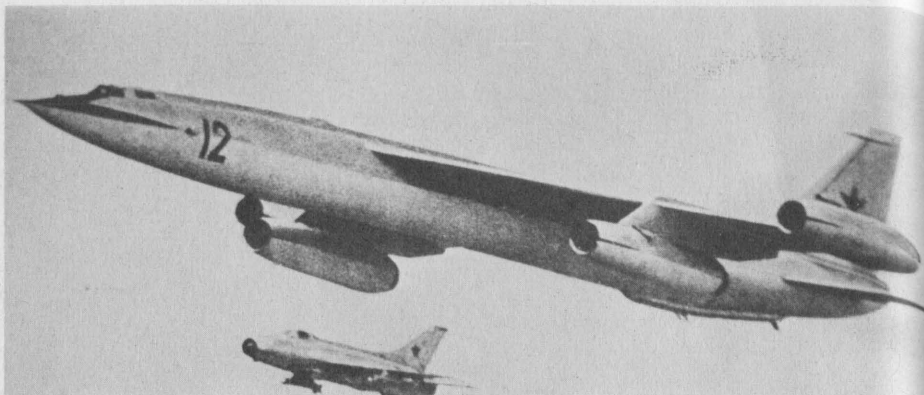
The Mya-4 was designed at about the same time and probably to much the same specification as the Tu-20. It would seem that on the whole the Soviet Air Force found the longer range of the Tu-20 more attractive than the higher speed of the Mya-4, and so it was the Tu-20 that was built in larger numbers, although it seems likely that at least 150 Mya-4's of all versions were built.

The normal bomber version carried a defensive armament of six 23 mm cannon, two in the tail and two each in radar-controlled barbettes, above and below the fuselage in front of the wing.

In 1959, a new version called the 201-M set several records for lifting loads to high altitudes, although at the time it was thought that these records were set by the M-52. At Domodedovo it was seen that the 201-M was in fact a new version of the Mya-4 designed for maritime reconnaissance. This version is in service with the Soviet Navy. It carries extensive radar equipment and is the type most likely to be met with in future. The normal bomber version had a crew of six but the 201-M version will carry extra radar operators. The engines fitted are Mikulin AM-3D axial-flow turbo-jets developing 19,200 lbs thrust in the earlier bomber version, and the very powerful D-15 units that were also fitted to the M-52 and develop about 28,600 lbs thrust.

*Data (201-M version) Wing span 170 ft. Length 175 ft. Height 50 ft.
Wing area 3,660 ft. Max. take-off wt. 352,750 lbs.
Max. speed 650 m.p.h.
Range 6,200 miles. Ceiling 46,000 ft.*





The very spectacular Mya-52 bomber with an escorting MIG-21F, which gives a good idea of the size of this unsuccessful delta bomber.

Myasishchev M-52 "Boulder"

The M-52 is included in this book, not because it is in service in the Russian Air Force, but because it is not! It was in the late fifties that reports of a Russian delta wing bomber were first published. Someone in Intelligence had been doing his homework, because it was not until 1961 that the M-52 made a public appearance at Tushino. It caused quite a stir at the time, and for some while Western experts were waiting for news that this mighty bomber was entering service. The news never came because by this time the M-52 had already been dropped by the Soviet Air Force as a result of changing requirements, and the fact that the machine almost certainly failed to reach the required performance figures. Once the excitement had died down Western experts decided that the top speed was far from being supersonic, except perhaps for a short dash, and its best speed was likely to be about Mach 0.9

So the M-52 never was built in quantity, despite what some people think, and it must be considered a very expensive failure, although it no doubt contributed much valuable data to its designers.

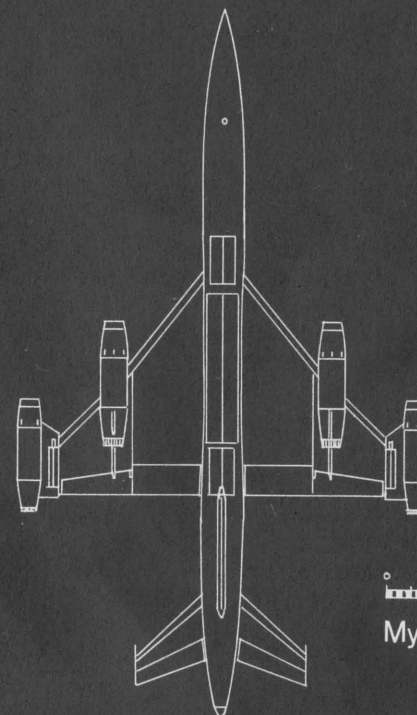
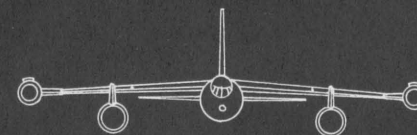
One interesting point remains however. In a publication in East Germany a drawing was shown, together with other project SST's, of an plane which was obviously a low wing passenger version of the M-52. So far as we know this remained only an interesting proposal.

The engines are D-15's, which are rated at 28,660 lbs thrust, and are among the world's most powerful turbo-jets. So far as is known, they have not been fitted to any other aircraft except the 201-M version of the Mya-4.

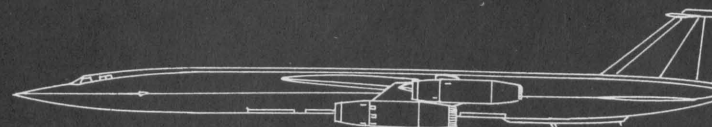
Data: Wing span 92 ft, to outside of wing tip engines. Length 181 ft.

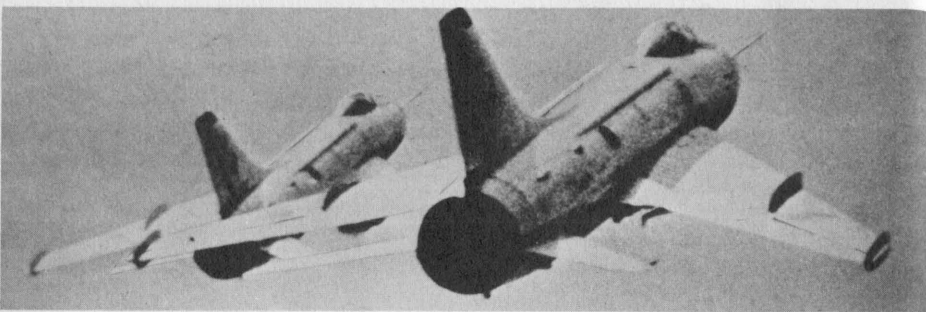
Max. take-off wt. approx 310,000 lbs.

Short dash max. speed Mach 1.4. Cruis. speed Mach 0.9; both speeds being estimates.



Mya-52





Scramble! Two Su-7B's of the Czech Air Force just after take-off.

Sukhoi Su-7 and Su-9 "Fitter" and "Fishpot"

For a long time Pavel Sukhoi was an "unlucky" designer. His Su-2 was in production for about three years as a two-seat light bomber, but after that he designed at least a dozen aircraft that reached prototype status but got no further for various reasons. In 1948, his notable lack of success caused considerable party displeasure, so the design group was broken up and the Su-17, a supersonic fighter prototype under construction, was scrapped.

However, in 1955 prototypes of the Su-7 and Su-9 first flew and deliveries started in late 1958. The two aircraft represent a rather clever piece of engineering. The Su-7, with the swept wings, is a close-support fighter which can carry up to a ton of bombs or rockets-and-bombs as well as long range fuel tanks. It also has a 30mm cannon in each wing root.

The Su-9 is a high altitude interceptor, with a delta wing fitted to a similar fuselage and tail unit. The normal armament is two "Alkali" missiles. The Su-9 looks very similar to the MiG-21, but in fact both of the Sukhoi machines are larger and cleaner than the MiG, and almost certainly have a better range and much better all-weather capability at the cost of a slightly lower top speed.

The Su-7 has been exported to some of the usual countries, namely Iraq, India, Czechoslovakia, Hungary, and East Germany; but the Su-9 has been kept strictly for home use, where it is in service in very large numbers. The Su-7 has been seen operating with two JATO rockets and parachute brakes fitted at the base of the rudder. The engines used are not known, but they must be very powerful, that of the Su-7 being estimated at 15,550 lbs thrust; 22,000 lbs with afterburning. The Su-9 may well be fitted with a more powerful version of the same engine, possibly being as high as 22,000 lbs.

Data: Su-7 Wing span 32 ft 3 ins. Length 55 ft. Height 16 ft.

Max take-off wt. 30,500 lbs.

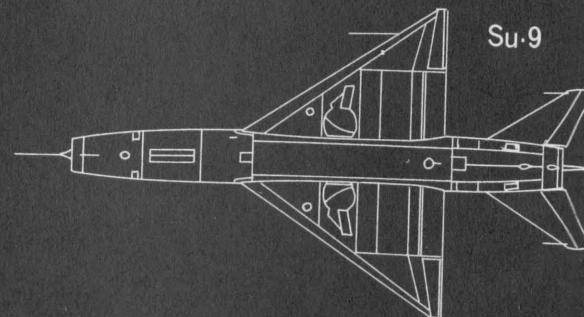
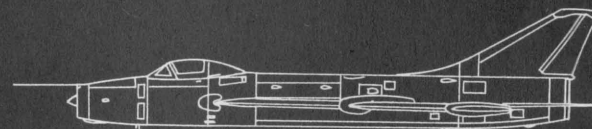
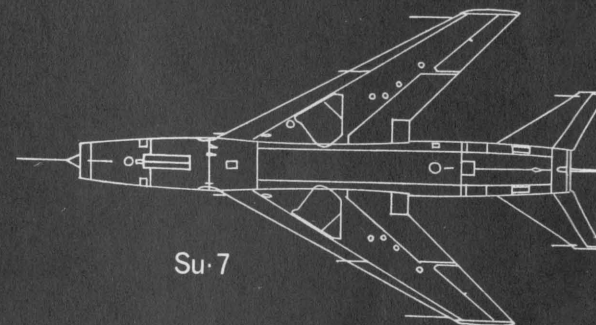
Max speed (clean) 1,056 m.p.h. at 36,000 ft.

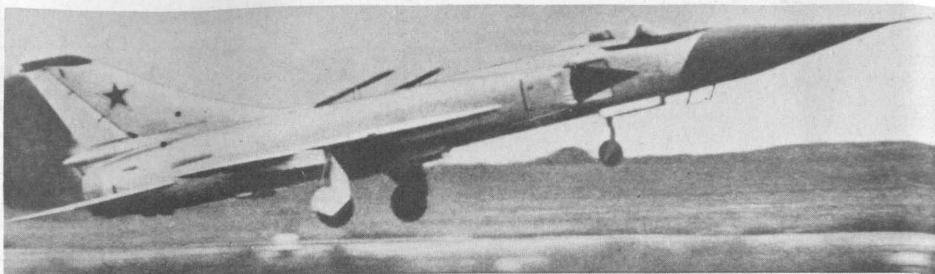
Data: Su-9 Wing span 31 ft. Length 55 ft. Height 16 ft.

Wing area 425 sq. ft.

Max. take-off wt. 30,000 lbs.

Max. speed (clean) 1,190 m.p.h. at 40,000 ft.





The STOL version of the Sukhoi fighter seen first in 1967, showing the undercarriage and flaps down and the intake for the vertical-lift engines open.

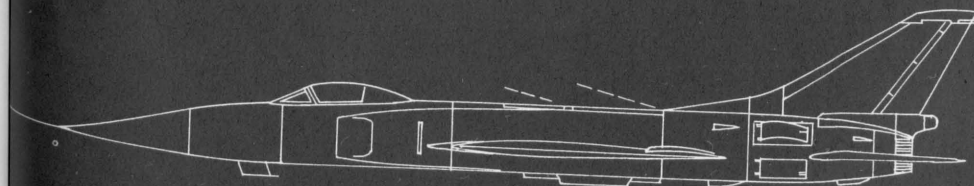
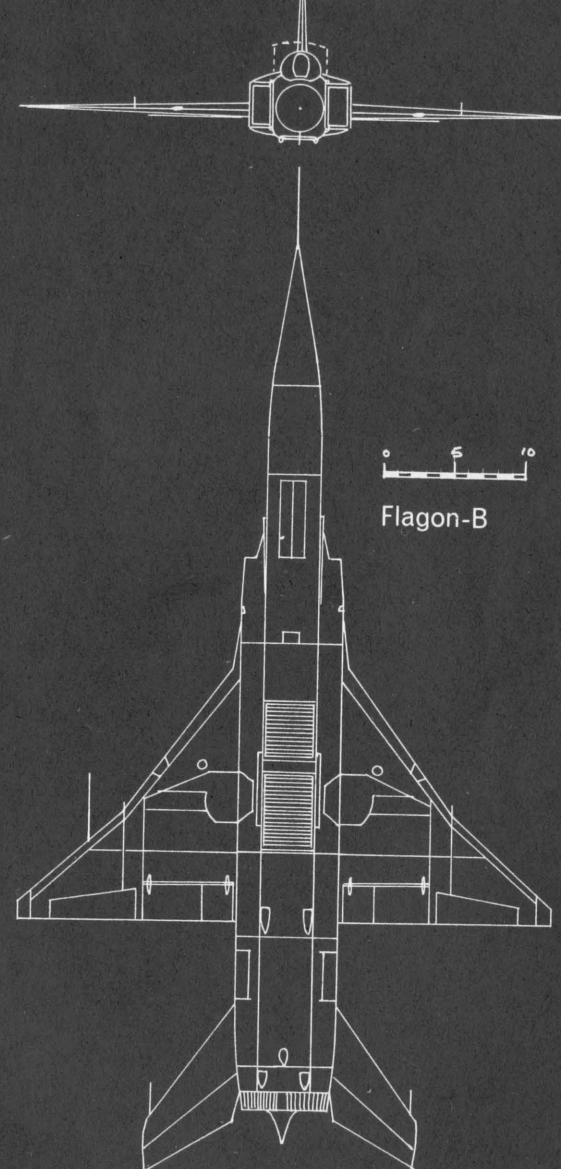
Sukhoi Su-11 "Flagon-A" and "Flagon-B"

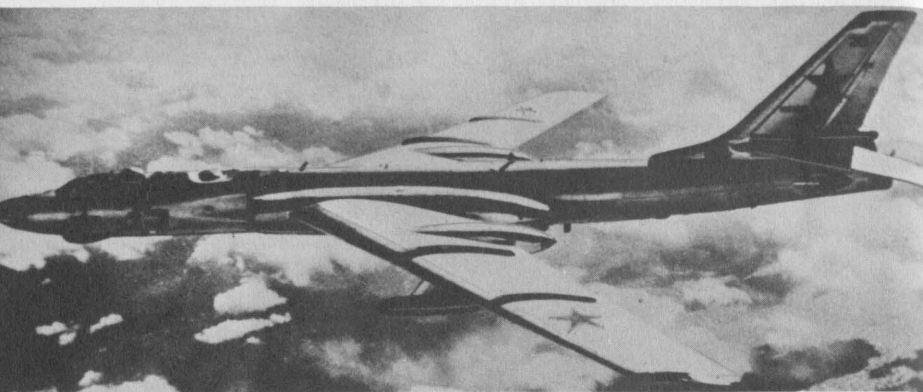
Many of the new types that first appeared at Domodedovo in 1967 were prototypes only, but at least we cannot say this of the Su-11, no less than ten examples of which were seen. It is obvious that the Su-11 was even then in service in some numbers, and it is reasonable to assume that many fighter units in Russia are now equipped with this rather handsome machine.

The twin turbo-jets are mounted in the rear of the fuselage, being fed air from large rectangular ram-type intakes. A large search radar is mounted in the nose. The standard armament seems to be a missile of the "Anab" type under each wing.

A development of the Su-11 design is the plane known at the moment as the "Flagon-B", which is an STOL version. This has two, or possibly three, lift engines installed amidships under rear-hinged intakes, and the wings are slightly altered. The span has been increased by about 5 ft, giving slight compound sweep to the delta wing. There is a fence at the point where the sweep alters. This aircraft also has the radar in the nose, and points under the wings to carry rockets etc., so that there seems no reason why this type should not appear in service, although so far as we know it has not yet done so. The difference between the two machines is slight of course and it could be that aircraft seen from a distance could be mistaken. At any rate the basic design is a very important one, is going to be in service for many years to come, and we must expect the STOL version to enter service as well. The engines are not known but are estimated to be of about 15,000 lbs thrust, 22,500 with after-burning.

Data: Wing span 33 ft 6 ins. ("Flagon-B" 38 ft 6 ins.) Length 71 ft. Height 16 ft. Max. take-off wt. 55,000 lbs approx. Max. speed 1,850 m.p.h. at 40,000 ft.





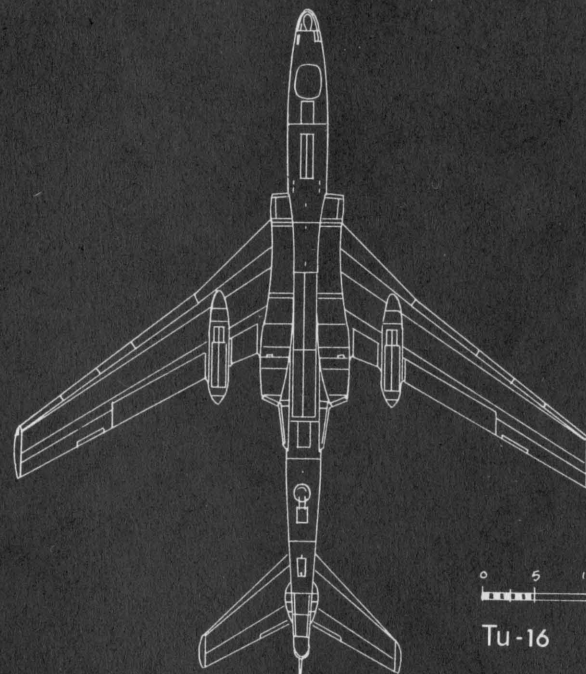
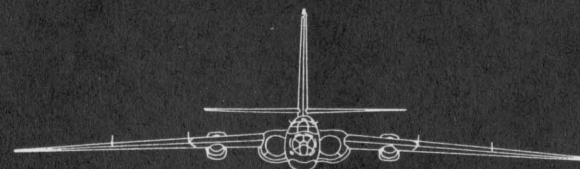
A long range reconnaissance version of the Tupolev Tu-16 bomber. Note the pod under the wing, presumably housing electronic equipment.

Tupolev Tu-16 "Badger"

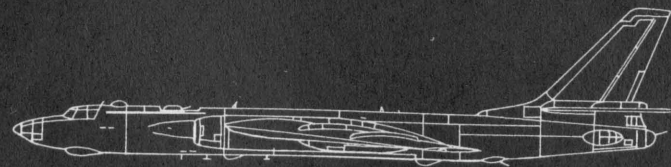
The Tu-16 has been in service for some years, first being seen in numbers in 1954. The fact that it is now somewhat out of date in performance should not make one believe that the Tu-16 is no longer of any importance. Nearly two thousand of these medium bombers were built and they are still in service in large numbers. The Tu-16 is one of the few large jet bombers that have been exported, some two dozen having been sent to Egypt and a similar number to Indonesia.

The Tu-16, called the Tu-88 by the design bureau, was originally intended to carry bombs in a normal bomb-bay between the two jet engines, but in its long operational life there have been alternations in the machine's role, so that various versions may be met with. "Badger-A" is the original bomber version, or that machine altered to carry out either electronic or photographic reconnaissance. In an anti-shipping role with a "Kennel" missile under each wing, it becomes "Badger-B"; while when fitted with a "Kipper" stand-off missile and a very much larger radar installation in the nose, it becomes "Badger-C". An interesting point about the Tu-16 is its very heavy armament. There are twin 23 mm cannon in the tail; in a barbette under the rear fuselage, and another behind the pilot's cockpit. The pilot also has a 23 mm gun firing forwards. There is no flight refueling equipment fitted to any version. The Tu-16 is being replaced by the Tu-22 but it is still being used for long range spyplane missions, especially round the coasts of Europe and Japan. The engines are Mikulin AM-3M turbo-jets, giving about 19,200 lbs thrust. From the Tu-16 was developed the Tu-104 jetliner, which uses the same wings, tail, and undercarriage.

*Data: Wing span 110 ft. Length 121 ft. Height 34 ft.
Wing area 1,815 sq. ft. Max. take-off wt. 170,000 lbs.
Max. speed 590 m.p.h. at 32,000 ft. Cruis. speed 405 m.p.h.
Range 1,900 miles. Ceiling 37,000 ft.*



Tu-16





The giant Tu-20 turbo-prop long-range bomber. The machine shown is the original bomber version, without all the electronic gear added to some later craft.

Tupolev Tu-20 "Bear"

The Tu-20 is unique. It is the only swept-wing turbo-prop bomber ever built, and should go into history as one of the great airplanes; at least in the author's opinion.

When the much bigger version of the Tu-4, the Tu-85, showed on test that it had the range required to bomb American cities (7,400), but not the performance to avoid the interceptors that it would meet, it was obvious that an even better machine was required. The Tu-20, called the Tu-95 by the design bureau, was one of the two machines accepted by the Soviet Air Force. The other was the Mya-4. This very large bomber has been built in fair numbers.

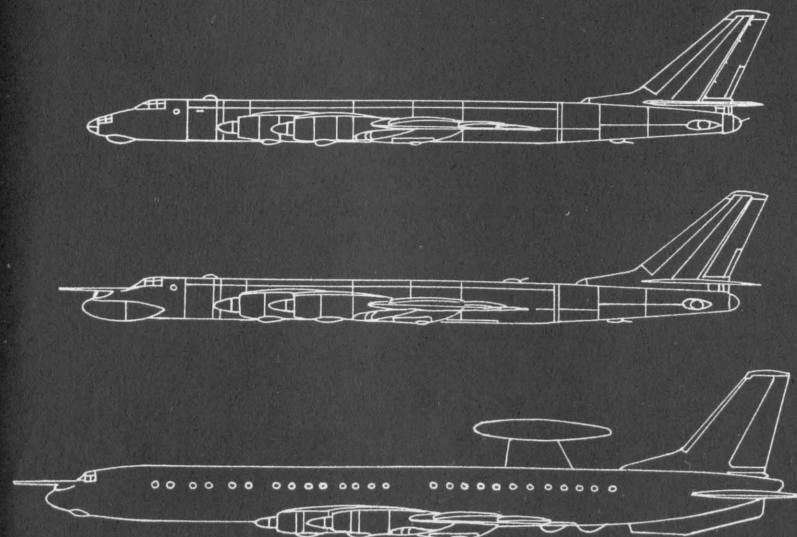
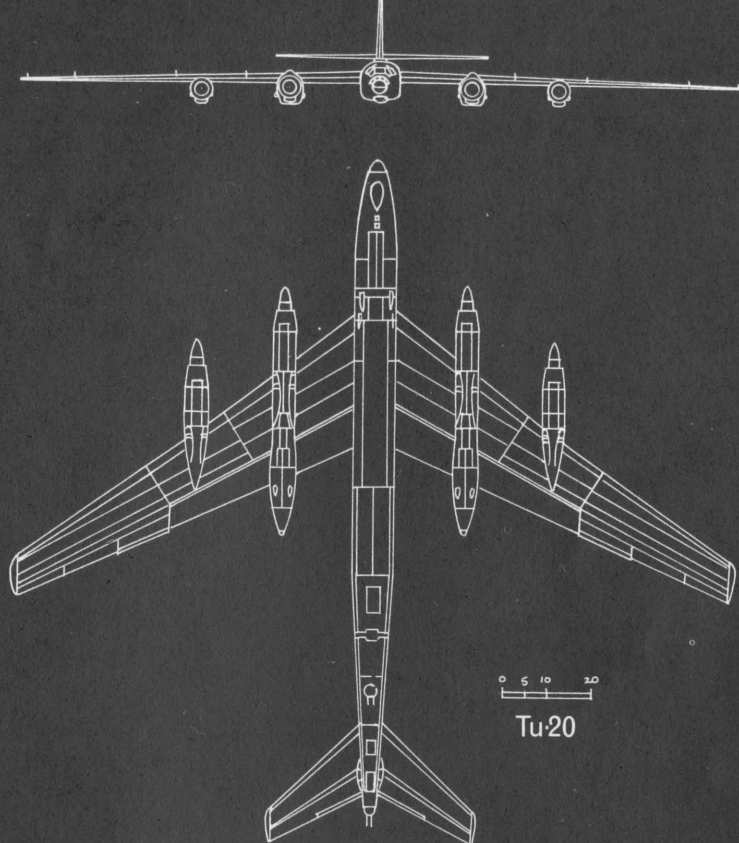
The Tu-20 is a mid-wing monoplane with all swept surfaces intended for a high performance. The engines were designed by engineers from the old war-time Junkers design team, and although they nominally develop 12,000 h.p., the usual max power is in fact about 9,000 h.p. But even with this lower power the top speed is probably about 560 m.p.h., which would make the Tu-20 one of the world's fastest propeller-driven aircraft. Originally built to drop free-falling bombs, as "Bear-A", as time went by it was developed to carry a "Kangaroo" very large stand-off missile, with much better radar equipment and flight refueling. This was "Bear-B" and it is usually this version that is met with nowadays on very long-range maritime reconnaissance missions. The Tu-20 carries at least four 23 mm cannon, two in the tail and two in a barbette under the rear fuselage. From the Tu-20 was developed the Tu-114 airliner, which has been used by "Aeroflot" in small numbers since 1961. It is a revise of this aircraft that has been made into an airborne early warning and fighter control aircraft with a huge radar installation above the rear fuselage. NATO calls this new combination "Moss". The engines on the Tu-20 are Kuznetsov NK-12, later versions of which, the NK-12MV, give a total of 15,000 h.p.

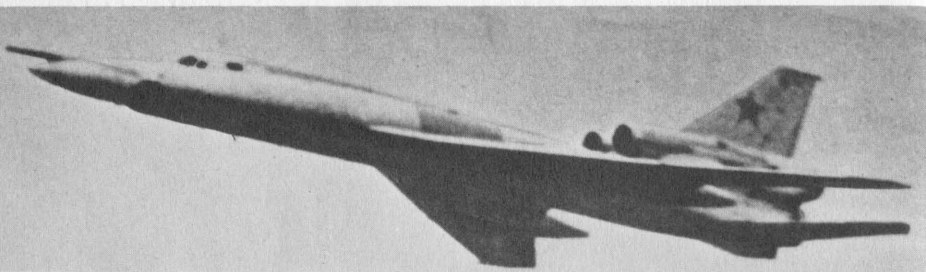
Data: Wing span 162 ft. Length 150 ft approx. Height 48 ft.

Max. take-off wt 380,000 lbs. Wing area 3,350 sq. ft.

Max. speed 560 m.p.h. Economic cruis. speed 450 m.p.h. at 33,000 ft.

Range 5,500 miles. Ceiling 39,000 ft.





The very elegant Tu-22 bomber.

Tupolev Tu-22 "Blinder"

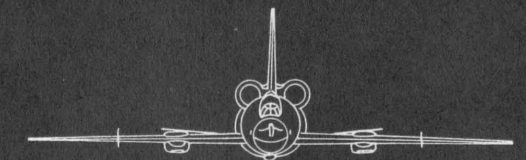
The Tu-22, or Tu-105 as it is called by the design bureau responsible for it, was first shown at Tushino in 1961. Since then it has entered service in the bomber units of the Soviet Air Force and also the long-range units of the Soviet Navy. It is in service in fair numbers although it has not been built in the same quantity as the Tu-16, which it is replacing.

The Tu-22 normally carries a crew of at least four and the usual extensive radar equipment is fitted, as is flight-refueling on most of the examples seen so far. There is a training version with an extra cockpit above and behind the normal pilots' cabin. Windows for cameras are fitted in the nose, and the sole armament is a 23 mm gun position in the tail, either remotely controlled or connected to the radar installation just above it.

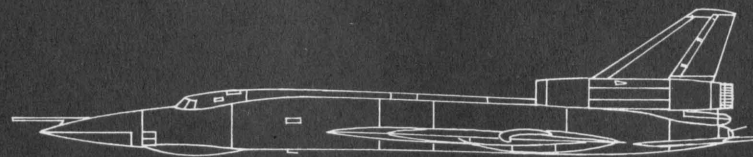
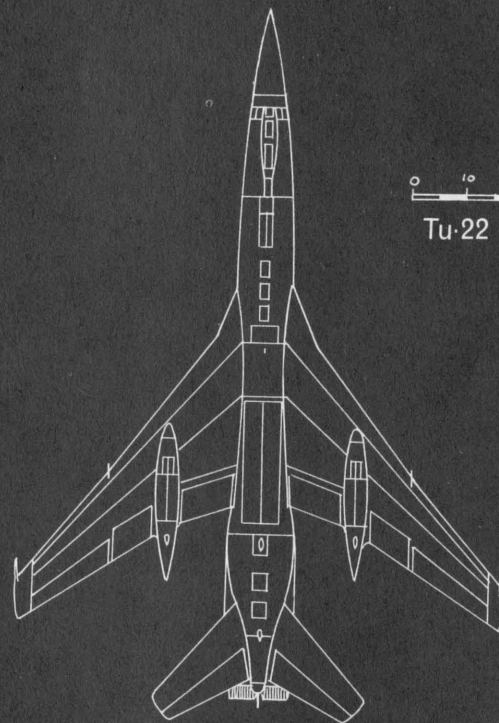
The Tu-22 can carry normal bombs in the bomb bay or it can carry the rather large "Kitchen" stand-off bomb semirecessed in the fuselage.

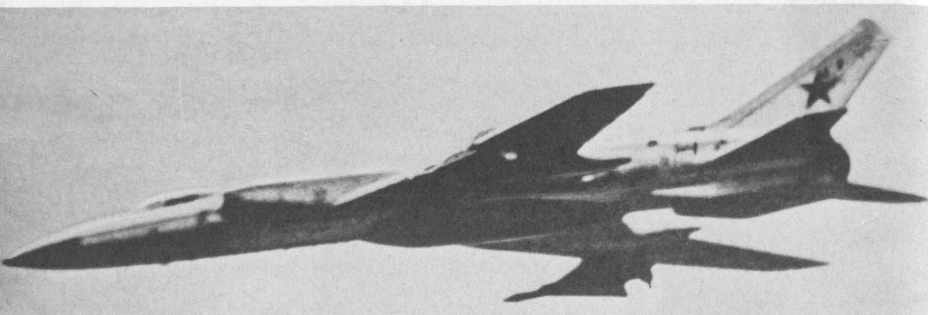
The engines are very powerful units of unknown make, but it is estimated that they develop 20,000 lbs thrust, going up to 27,000 lbs with afterburning. All told, the Tu-22 must be considered a very fine aircraft which will be in service for a few years to come.

*Data: Wing span 91 ft. Length 133 ft. Height 17 ft.
Wing area 2,030 sq. ft. Max. take-off wt. 185,000 lbs.
Max. speed 990 m.p.h. at 40,000 ft. Max. cruise speed 630 m.p.h.
Range 1,500 miles. Ceiling 60,000 ft.*



0 1.0 2.0
Tu-22





The heavy, long-range interceptor, the Tu-28, which usually carries either one or two "Ash" missiles under each wing.

Tupolev Tu-28 "Fiddler"

For a long time, the "Fiddler" was assumed to be a Yakovlev design, but recently it has been positively identified as a Tupolev machine. If you compare the wing of the Tu-22 and the Tu-28 you will see that they are very similar, so the news that they both come from the same design bureau should be no surprise.

The Tu-28 first appeared at the Tushino display of 1961, and it is assumed to have gone into service about 1965. It was certainly in service in numbers in 1967, as a formation of 12 took part in the Domodedovo Air Show. It must be assumed therefore that it is in service in fairly large numbers.

The Tu-28 is a long-range interceptor with the likelihood that it could carry out reconnaissance and even strike operations if needed. It must be remembered that the Russian borders are very long indeed so that in some instances, especially along the northern coast, the distances to effect an interception could become very long indeed.

This machine needs good radar equipment therefore, and various nav aids are in fact fitted. Early machines were fitted with a large bulge containing radar of some sort, and a long fin under each engine, but later examples have done away with both of these fittings, and the machine is all the cleaner for it.

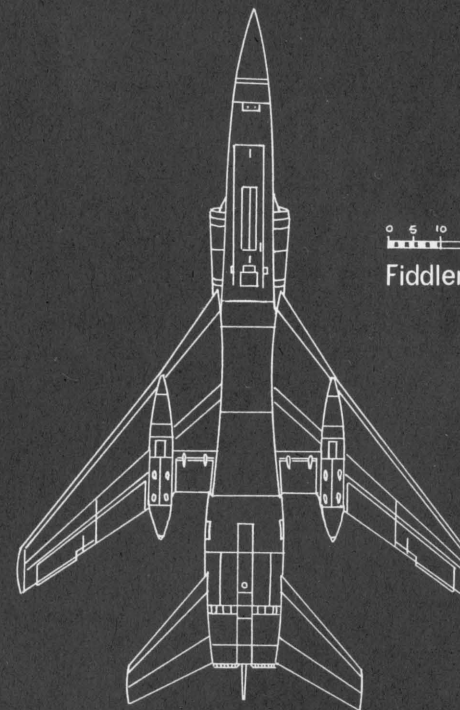
Normal armament is either one or two "Ash" air-to-air missiles under each wing. There do not seem to be any guns fitted. The engines are not known, but they must give about 22,000 lbs thrust, possibly being the same as those fitted to the Sukhoi Su-7 or 9.

Data: Wing span 65 ft. Length 90 ft. Wing area 850 sq. ft.

Max. take-off wt. 90,000 lbs.

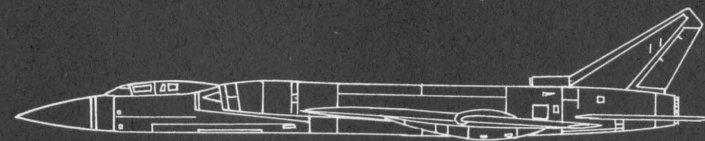
Max. speed Mach 1.7 (clean), and about 1.5 with the missiles underneath.

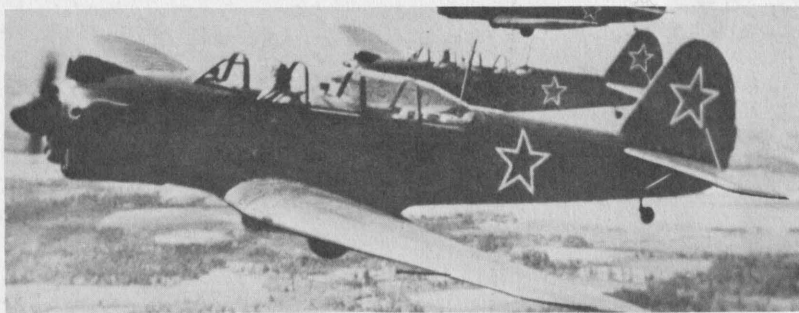
Range about 1,500 to 1,700 miles



0 5 10 20

Fiddler





A group of Yak-18's. These machines are the first version with the helmet type cowlings and the two-wheel undercarriage, many of which served the Soviet Air Force for years.

Yakovlev Yak-18 "Max"

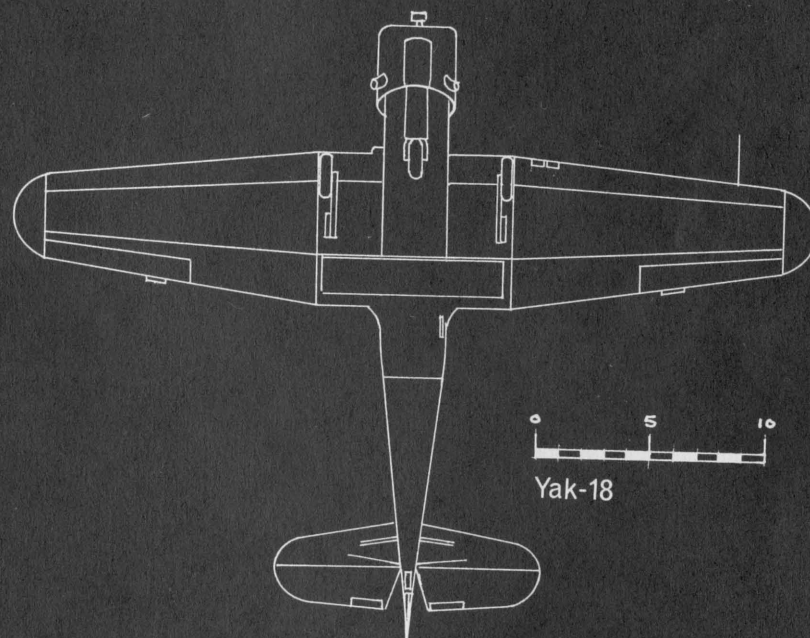
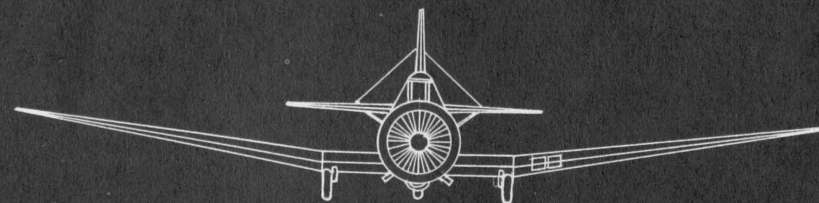
Aleksandir Sergeiovich Yakovlev designed his first powered airplane in 1927. This was a small biplane called the AIR-1, and throughout the late twenties and thirties he produced a whole range of light aircraft, including the AIR-10. This was a two-seat trainer also known as the Ya-10. It was developed for the Soviet Air Force and became the UT-2, which was used in huge numbers until after WW-II. Yakovlev was working on a replacement of the UT-2 in 1938, but work on this was stopped so that work on a new single-seat fighter could take priority, this was the I-26, which became the Yak-1. Work on the new trainer was restarted after the war and this became the Yak-18.

The Yak-18 has been in production, in one form or another, more or less since WW-II. The original version was the Yak-18 with a two-wheel undercarriage which retracted, and with "helmet" cowlings over each cylinder. The Yak-18U came out in 1955 with a tricycle undercarriage. In 1956 the M-11 engine was replaced by a AI-14R radial, and this was given a smooth cowling. In 1961 the single-seat aerobatic Yak-18P was introduced. This was built in two versions, and so far as we know it still is. One version has the cockpit above the trailing edge of the wing and forward retracting main wheels, while the other type has the cockpit over the leading edge of the wing and the main wheels retract inwards. The Yak-18P is the machine used by all the Russian aerobatic experts for competitions in which they have been so very successful.

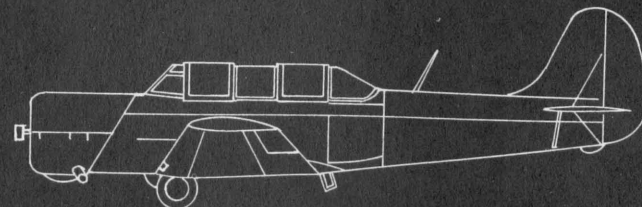
In 1967 the Yak-18T was shown at Paris. This is a low wing cabin monoplane seating four using standard Yak-18P wing tail surfaces and the same engine. It was designed by S. Yakovlev, son of A.S. Yakovlev, the original designer of the series.

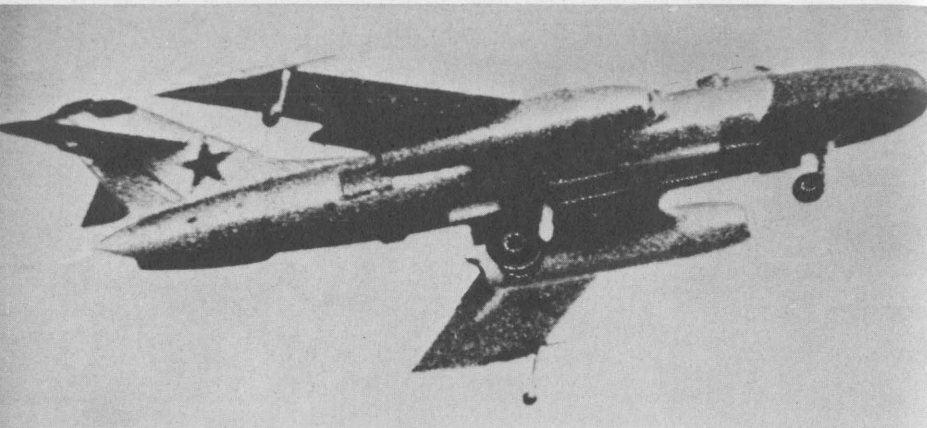
The engine fitted to the early versions was the Shvetsov M-11 of 160 h.p. The later craft had the Ivchenko AI-14R which gave 260 h.p.

Data: (Yak-18A) Wing span 34 ft 9 ins. Length 28 ft. Height 11 ft. Wing area 183 sq. ft. Wt. empty 2,259 lbs. Max. take-off wt. 2,901 lbs. Max. speed 163 m.p.h. Economic cruises 140 m.p.h. Range 465 miles. Ceiling 16,600 ft.



Yak-18





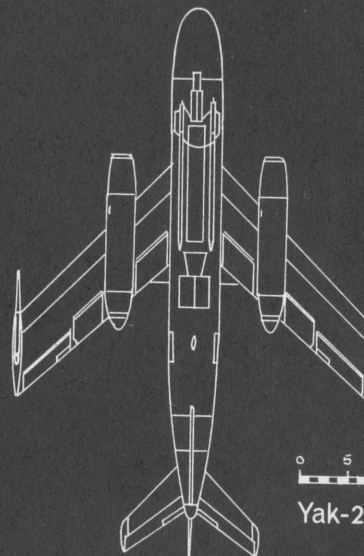
A Yak-25 all-weather fighter with flaps and wheels down.

Yakovlev Yak-25 "Flashlight"

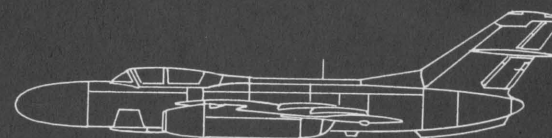
The Yak-25 was the first proper all weather fighter to be fitted with adequate search radar to go into service in the Soviet Air Force. The prototypes first flew in 1952 and the production aircraft was soon in service with units of the air force. It was first on display in 1955 in significant numbers.

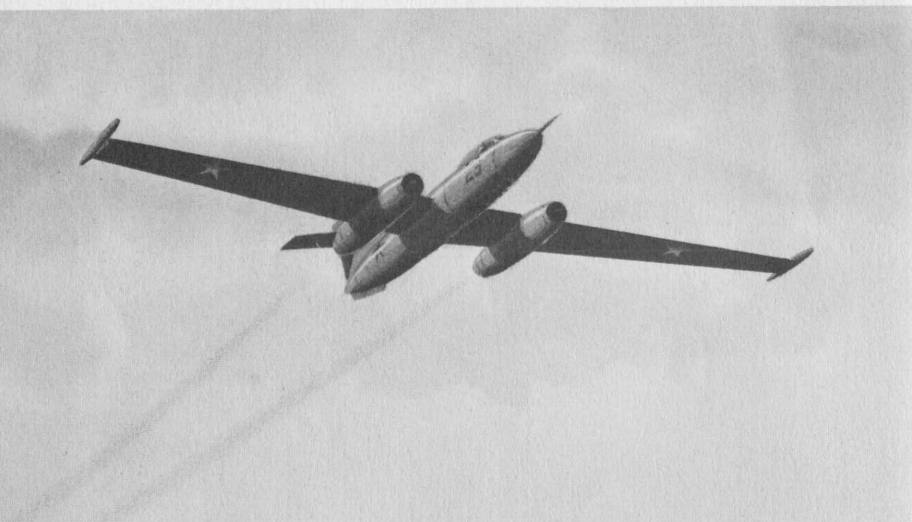
At the 1956 display some of the variations were shown and the original fighter design became known as "Flashlight-A". The version with a single seat canopy and a glazed nose became type "B," and type "C" was similar with a solid radome in the nose and longer engine units. Type "D" was a modified version of type "B" but with the longer engine units, slight wingtip extensions and only one cannon, whereas the usual fighter version carries two 37 mm weapons, as well as a pack that can carry a cluster of unguided 55 mm rockets. The Yak-25 is a very unremarkable fighter of the period, the most interesting point in the design being the zero-track tricycle undercarriage with the outrigger units at the wingtips. The crew is almost always two. The engines are the Klimov VK-5 units that develop 6,500 lbs thrust, and this power would not give the Yak-25 sufficient speed to catch up with the bombers of its day, such as the American B-47 and Britain's V-bombers, so that further development was required, which led to the Yak-28 series.

*Data: Wing span 38 ft 6 ins. Length 62 ft. Height 14 ft 6 ins.
Wing area 340 sq. ft. Take-off wt. 25,000 lbs estimated.
Max. speed 700 m.p.h. at 36,000 ft. Ceiling 51,000 ft.*



Yak-25





As no photos of "Mandrake" have come to light, the author prepared this drawing from the available information.

Yakovlev "Mandrake"

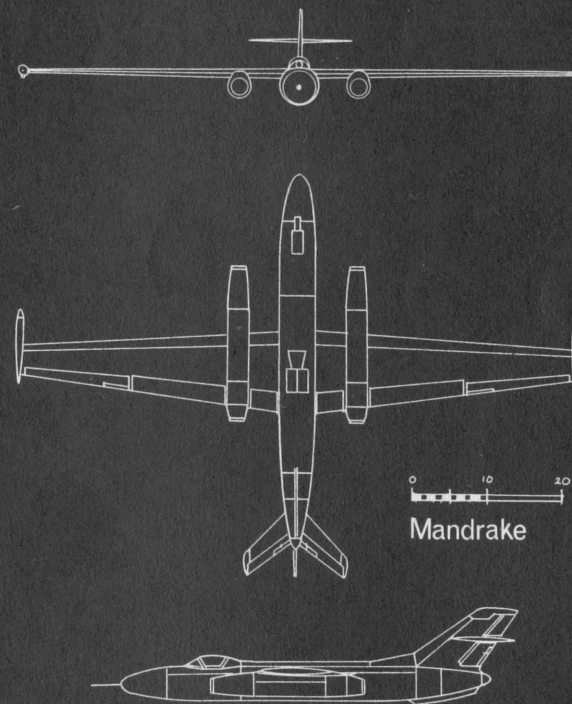
For some years there have been reports of a high altitude Soviet reconnaissance plane based on the Yak-25. This craft was given the code name "Mandrake," but very little has been heard of it for a few years, although the high altitude machine that sometimes appears over northern India could well be a "Mandrake". It seems likely that "Mandrake" is chiefly used on operations over China, where Russia likes to know what is going on and there is not so great a chance of the spyplane being intercepted.

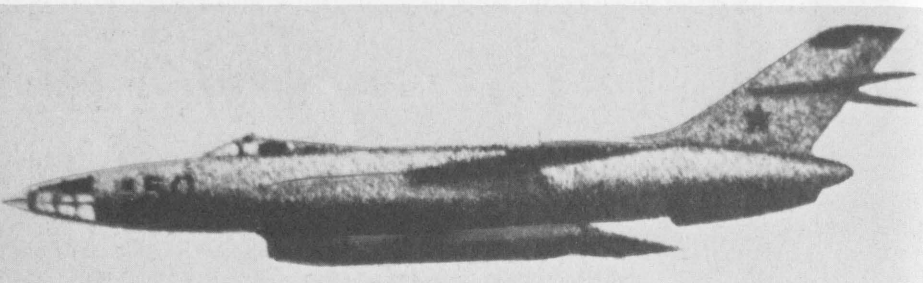
"Mandrake" has the standard fuselage of the Yak-25 complete with tail unit, although it is a single seater. The engines are assumed to be the TDR R.37RF units that are fitted to the Yak-28 series. The chief modification is of course the wing. This is a normal straight, slightly tapered wing with a span of something between 70 and 80 ft.

The performance is not likely to be in the same class as the Lockheed U-2, but as the "Mandrake" is really only a rather extensive modification of a standard fighter instead of a specialized design, this is hardly surprising. It is estimated that "Mandrake" would operate at about 55,000-60,000 ft. The cruising speed is roughly 475 m.p.h., and the range is not likely to be more than 1,200 miles or so, unless drop tanks are carried.

For the effort of designing and building a new wing, the Russians got quite a good "spyplane" but most likely only a few were built.

Estimated dimensions: Wing span 75 ft. Length 51 ft.





The Yak-28 light bomber; the all weather fighter developed from this is the Yak-28P.

Yakovlev Yak-28 "Brewer" and "Firebar"

When the limitations of the Yak-25 became obvious in service, at least in the interceptor role, the Russians had the choice of either developing a new type or modifying the Yak-25 series even further. After several projects, they decided to "stick with the devil they knew" and so a further set of Yak twin-jet planes was designed.

Although the Yak-28 looks similar to the earlier machine, in fact it has an entirely new wing which is mounted in the shoulder position instead of the mid-wing of the Yak-25. This is to accommodate the larger diameter power units. The other chief modification was the fitting of a bicycle undercarriage. Various versions of the basic design were built but the only ones to enter squadron service are the fighter version, the "Firebar", and the tactical general purpose machine, the "Brewer", originally called "Brassard". Both of these are in service in fairly large numbers, but so far none of them seem to have been exported, even to Warsaw Pact countries.

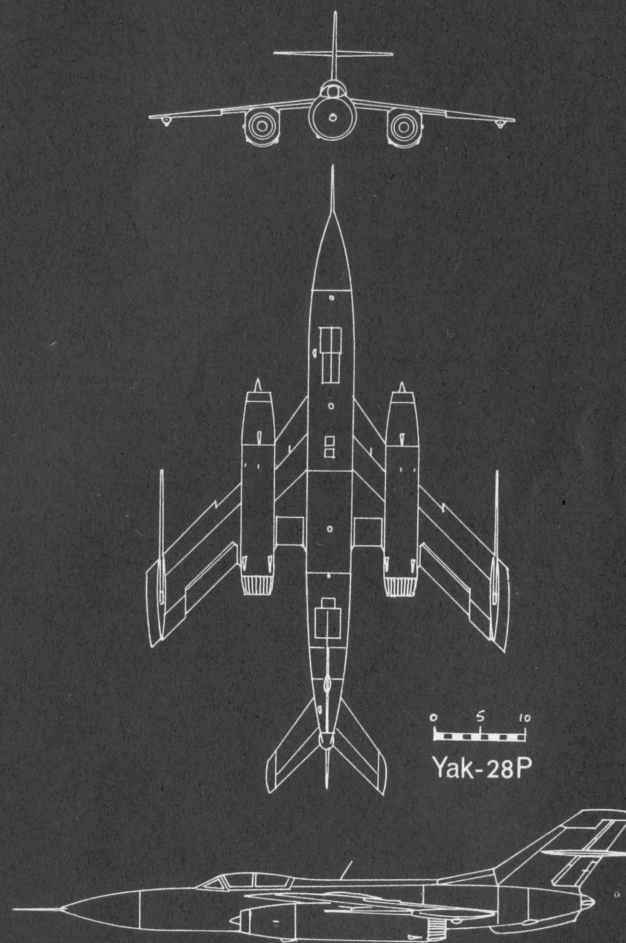
The "Firebar" is armed with two "Anab" guided missiles and the "Brewer" has a small weapons bay under the wing in the fuselage, which might just house a small nuclear weapon. The crew is usually two, although the "Brewer" might carry three on some missions. The engines are TDR R.37RF turbo-jets giving about 12,500 lbs thrust with reheat. The result is an fighter that looks more potent than it really is, although the Yak-28 should be a useful airplane for some years to come.

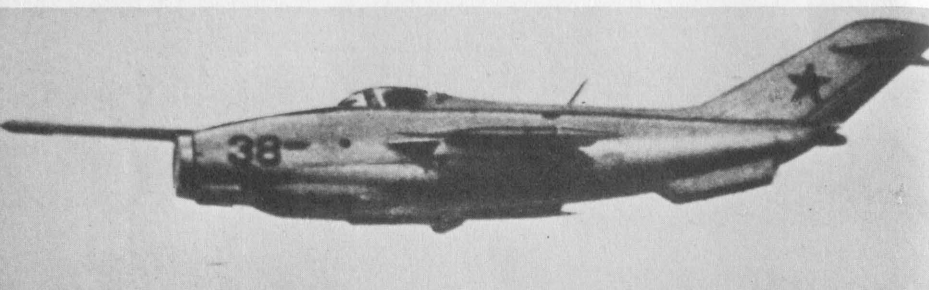
Data: Wing span 40 ft 6 ins. Length 62 ft. Height 14 ft 6 ins.

Wing area 400 sq. ft. Take-off wt. 35,000 lbs estimated.

Max speed 800 m.p.h. at 36,000 ft.

Ceiling 51,000 ft.





The Yak-36 vertical take-off aircraft. Displayed in 1967, one machine carried a rocket pod under each wing, and it could be developed into a light strike aircraft.

Yakovlev Yak-36 "Freehand"

This craft, one of the many new types first seen in 1967 at Domodedovo, is the only VTOL fighter except the Hawker "Harrier" to use vectored thrust. This seems to be the only worthwhile design for a VTOL fighter, the idea of carrying around several lift engines to be only used at take-off and landing seems a weight extravagance that a fighter cannot afford.

Western experts have all agreed that this machine is an experimental type only, and the estimated top speed is only Mach 0.85, which is not very exciting but of course, having made this machine work (and work very well), it should be worthwhile to refine the design. But even as it is, one of the prototypes was demonstrated with a rocket pod under each wing, and it seems to the author that Yak-36 would make a useful VTOL strike aircraft to operate from the two cruiser/carriers "Moskva" and "Leningrad". These radar-laden vessels normally carry about 20 Ka-25 helicopters, but a few "Freehand" type aircraft would add vastly to their striking power, and this is a development that should be looked for. "Faithless" and "Flagon-B" are both too big and would both require too much space for this kind of operation.

The engines are two 7,000-9,000 lbs-thrust, vectored-thrust turbofans, possibly based on the Klimov VK-5 or VK-7 series of turbo-jet engines.

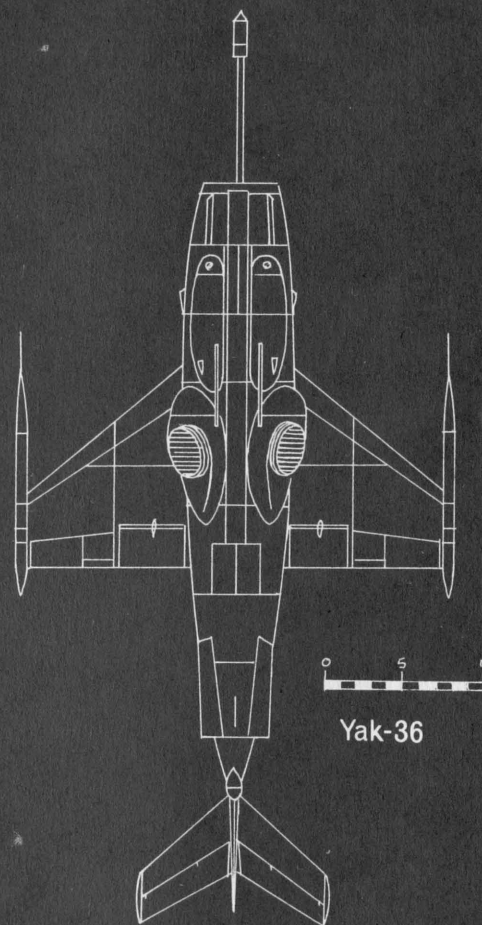
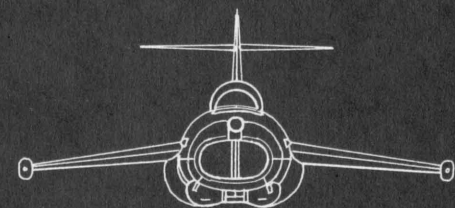
Data: (Estimated) Wing span 27 ft. Length 53 ft including 8 ft nose boom.

Height 13 ft.

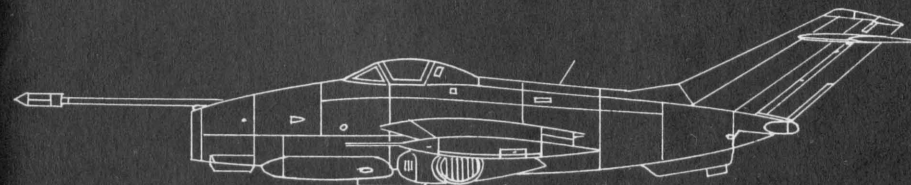
Take-off wt. 18,000 lbs.

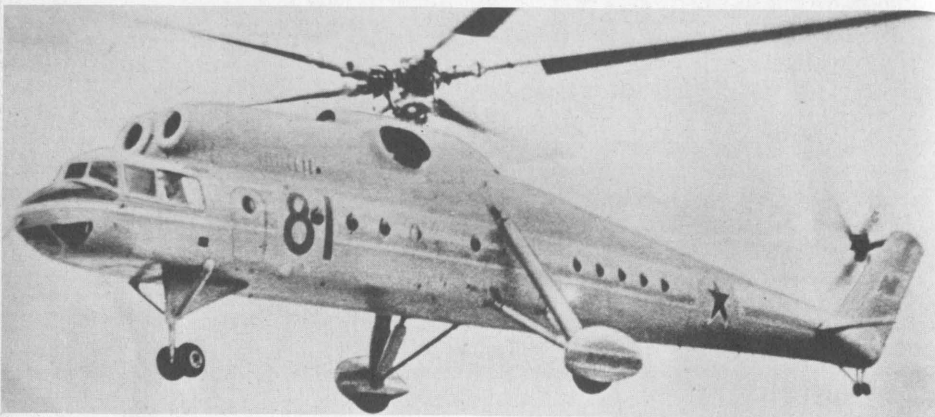
Max. speed 650 m.p.h. at sea level. Cruis. speed 500 m.p.h. at 5,000 ft.

Tactical radius about 175 miles.



Yak-36





The Mil Mi-6 and 10 are the largest helicopters in service in numbers. The machine shown here is an Mi-10.

Mil Mi-6 "Hook"

Until the arrival of the gigantic Mil V-12 twin-rotor helicopter at the Paris Show, 1971, the Mi-6 was considered a giant helicopter, and it is still the largest machine of its type in service and in production in the world.

The late Mikhail Mil had built gyroplanes and helicopters since the thirties, although his first to be put into production was the Mi-1, which went into service in 1951. The Mi-6 was first announced in 1957, and since then it has been built in fairly large numbers. The Mi-6 is in service all over the world doing jobs that no other machine could do. It is in service with the Red Army both as a troop transport and as a heavy equipment transporter. Aeroflot also uses many Mi-6's. Up to 70 fully equipped paratroopers can be carried, or a load of about 13 tons. Rear loading through the usual clam-shell doors and a ramp mean that bulky army vehicles can be carried.

The Mi-10 "Harke" is a flying crane version of the earlier machine with a slimmer fuselage and tall undercarriage legs. There is also the Mi-10K which has a more normal undercarriage. Both the Mi-6 and the Mi-10 are dwarfed by the new V-12 (Mi-12) which has two of the Mi-6 rotor and motor assemblies, one on each side of the 200 ft fuselage on a system of a thin wing and some struts. This machine can lift a load of some 40 tons.

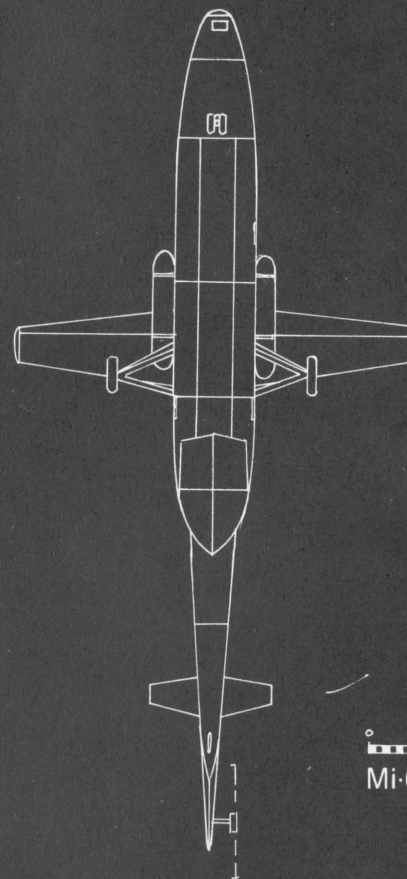
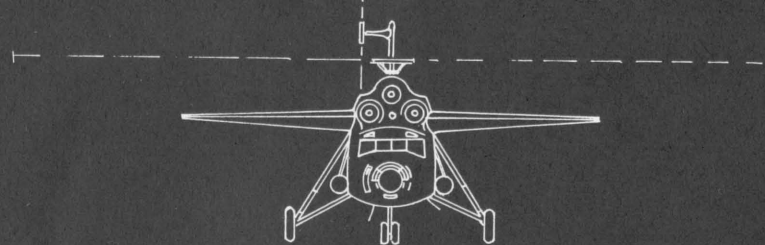
The Mi-6 is fitted with two Soloviev D-25V shaft-turbines each developing 5,500 h.p. The auxiliary wings are detachable and would not be used if the machine was being employed as a crane or for water-bombing.

Data: Diam. of rotor 114 ft 10 ins. Length of fuselage 122 ft 6 ins.

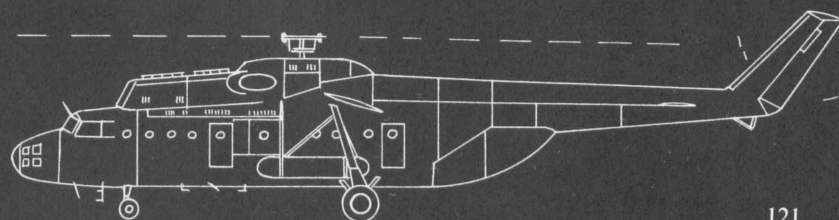
Wt. empty 59,500 lbs. Wt. max. load. 93,700 lbs.

Max. speed 186 m.p.h. Cruis. speed 155 m.p.h.

Max. range 652 miles. Ceiling 14,700 ft.



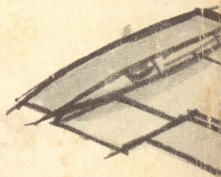
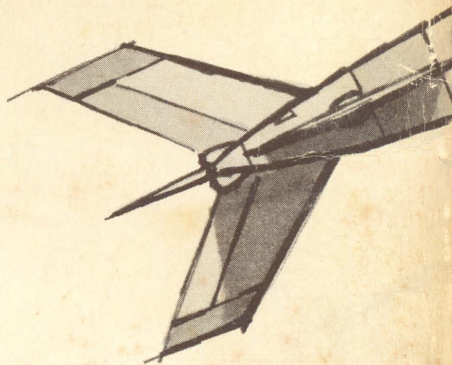
0 10 20
Mi-6



Colin Munro was born in South London in 1923 and "spent the first eighteen years" of his life building model airplanes. He joined the R.A.F. in 1942 and was sent to Canada to learn the trade of Bombardier, or "Air Bomber" as the British call it. In Canada he started a file on Russian aircraft. He returned to England and flew with a Special Duty squadron of R.A.F. Bomber Command.

After the war he went into advertising as a layout artist, was married in 1953, and now has two daughters and two sons. He became interested in the old car movement, and had several Vintage and one Edwardian car at one time or another. Munro edited the Magazine of the Veteran Car Club of Great Britain for four years and edited their yearbook for three years. His current old vehicle is an early three ton lorry that is scattered over much of Kent, though one day soon the pieces will get put together again.

In 1966, Munro began writing about airplanes, having had a series of articles, with illustrations, published in England and Canada. He also wrote a small reference book on cars, published in 1970. He has been researching Russian aircraft for several years.



MODERN AIRCRAFT SERIES